digitally steerable array

DSA250i & DSA230i LOUDSPEAKER
OWNER'S MANUAL

EAW

DSAi Series Owner's Manual

Congratulations on the purchase of your new EAW loudspeaker. You now own one of the finest professional audio products available - the result of exceptional engineering and meticulous craftsmanship. Please read these instructions to get the maximum performance from your new loudspeaker.

SAFETY PRECAUTIONS - READ THIS FIRST

SAFETY INSTRUCTIONS

Read and heed all warnings and safety instructions in the accompanying "EAW Loudspeaker Manual" before using this product. Failure to follow this precaution may result in equipment damage, personal injury, or death.

WARNING: The loudspeaker is supplied with an ac mains power cable. Depending on the voltage model ordered, this cable is configured with the most common ac mains connector for that voltage. If the connector is not compatible with the local ac mains receptacle, employ a licensed electrician to re-configure the cable with the proper connector. Ensure that ac power supply has a properly grounded safety ground. Failure to follow this warning could cause equipment damage, injury, or death.

CONSIGNES DE SÉCURITÉ - À LIRE EN PREMIER

INSTRUCTIONS RELATIVES À LA SÉCURITÉ

Lisez et respectez toutes les consignes de sécurité et les mises en garde fournies dans le manuel des enceintes EAW avant d'utiliser ce produit. Le non-respect de ces consignes et mises en garde peut entraîner des dommages aux équipements et des accidents aux personnes pouvant être fatals.

ATTENTION: L'enceinte est fournie avec un cordon secteur. Selon la tension du modèle commandé, ce câble est fourni avec la fiche la plus communément utilisée avec cette tension. Si la fiche n'est pas compatible avec les prises secteur de votre région, faites appel à un électricien agréé pour modifier le cordon secteur en fonction du format local. Vérifiez que la fiche secteur dispose d'une mise à la terre. Le non-respect de la mise à la terre peut entraîner des dommages aux équipements et des accidents aux personnes pouvant être fatals.

PRECAUZIONI DI SICUREZZA - DA LEGGERE PER PRIMO

NORME DI SICUREZZA

Prima di procedere con l'utilizzo del prodotto, leggere e rispettare ogni avvertenza e norma di sicurezza riportata nel "Manuale EAW Loudspeaker". Il mancato rispetto di ogni precauzione può causare danni all'apparecchiatura, nonché infortuni alle persone o la morte.

ATTENZIONE: Il diffusore è completo di cavo d'alimentazione ac fornito in dotazione. In base la voltaggio del modello di diffusore acquistato, il cavo è configurato con il connettore ac più adeguato. Nel caso in cui il connettore non sia compatibile con le prese di corrente adottate nell'area d'impiego, rivolgersi ad un elettricista qualificato per ri-configurare il cavo con il connettore più appropriato. Assicurarsi che la presa di corrente sia adeguatamente collegata a terra. Il mancato rispetto di tali norme può causare danni all'apparecchiatura, nonché infortuni alle persone o la morte.

PRECAUCIONES DE SEGURIDAD - LEA ESTO PRIMERO

INSTRUCCIONES DE SEGURIDAD

Lea y observe todos los avisos e instrucciones de seguridad que aparecen en el "Manual de altavoces EAW" adjunto antes de usar este aparato. El no observar esta precaución puede dar lugar a averías en el aparato, daños en las personas o incluso la muerte.

PRECAUCION: El altavoz viene de fábrica con un cable de corriente. Dependiendo del voltaje que use el modelo solicitado, este cable estará configurado con el enchufe más habitual para ese tipo de corriente. Si ese enchufe no es compatible con su salida de corriente, contacte con un electricista profesional para que cambie el enchufe del cable por el tipo adecuado. Asegúrese de que la salida de corriente tenga una conexión a tierra adecuada. El no observar esta advertencia puede dar lugar a averías en el aparato, daños en las personas o incluso la muerte.

SICHERHEITSHINWEISE - LESEN SIE DIESEN ABSCHNITT ZUERST

SICHERHEITSANWEISUNGEN

Lesen und beachten Sie alle Warnungen und Sicherheitsanweisungen der mitgelieferten "EAW Lautsprecher Bedienungsanleitung" vor der Benutzung des Produkts. Nichtbeachtung dieser Hinweise können möglicherweise zu Schäden am Equipment oder zu Verletzungen bzw. zum Tod von Personen führen.

WARNUNG: Der Lautsprecher wird mit einem Netzkabel geliefert. Abhängig von der jeweiligen Netzspannung wird das Kabel mit dem für die jeweilige Netzspannung gängigsten Netzstecker ausgeliefert. Sollte der Netzstecker nicht in Ihre Netzsteckdose passen, dann lassen Sie von einem zugelassenen Elektrobetrieb einen passenden Netzstecker montieren. Stellen Sie sicher, dass der Schutzkontakt der Netzsteckdose einen guten Kontakt zur Erde hat. Nichtbeachtung dieser Hinweise können möglicherweise zu Schäden am Equipment oder zu Verletzungen bzw. zum Tod von Personen führen.

EC DECLARATION OF CONFORMITY

Eastern Acoustic Works, as the manufacturer, hereby certifies that, in their delivered versions,
Product Models: DSA230i and DSA250i
Product Description: Self-powered loudspeaker
comply with the provisions of the standards listed below.

European Council Directive on Restriction of Hazardous Substances, 2002/95/EC

European Council Directive on Low Voltage, 73/23/EEC

European Council Directive on Electromagnetic Compatibility 89/336/EEC and 93/68/EEC
EN 50081-1:1992 Emissions limits for residential, commercial, and light industrial equipment (generic standard)
EN 50082-1:1997 Immunity requirements for residential, commercial, and light industrial equipment (generic standard)

Harmonized Standards:
EN55103-1 emissions
EN55103-2 immunity
EN60065 safety

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Chapter 1 Introduction

The DSA250i full-range and DSA230i voice-only or low frequency system are small format, column-type loudspeaker systems with a user-variable vertical beamwidth. The loudspeakers, known as modules herein, can be used as singly or combined in multiples as clusters. The easy-to-use DSAPilot software allows accurate adjustment of a module's or a clusters's coverage area from a fixed, vertical mounting location. In addition to excellent vocal performance, the DSAi Series is fully capable of full-range music applications. With integral DSP (digital signal processing) and amplification, DSAi modules are economical and simple to use. Computer communications are via EIA-485 or optional CobraNet™ network.

This manual provides information about the design, configuration, and operation of DSAi Series modules. It is intended to be used in conjunction with the DSAPilot Windows®-based software.

Chapter 2 Unpacking

2.1 Contents

QTY	PART #	DESCRIPTION
(1)	*	DSA230i or DSA250i loudspeaker
	*	Part number varies with finish color and ac mains voltage
(1)	425017	EAW Loudspeaker Owner's Manual
(1)	RD0370	DSAi Owner's Manual
(1)	0005854	1 ft Cat-5 Signal Link Cable RJ-45 to RJ-45 (wired as a crossover cable)
(1)	005085	Neutrik® PowerCon™ NAC3FA in-line plug
(4)	0005850	Phoenix Contact MSTB 2,5/3-STZ-5,08 3-pin in-line plug
(2)	0006118	Enclosure Bracket
(2)	102195	3/8-16 x 2 in Enclosure Bracket Bolt
(2)	102035	1/4-20 x 3 in Retainer Bolt
(2)	105011	3/8 in Lock Washer
(2)	105004	1/4 in Lock Washer
(2)	0006119	Wall Bracket
(1)	0017797	DSA CD-ROM containing DSAPilot and other documentation
(1)	RD0084	DSA230 Series or
	RD0085	DSA250 Series Wall Bracket Mounting Template (Printed on shipping carton)

2.2 Shipping Damage

After unpacking, if the loudspeaker is found to have shipping damage, save the packing materials for the carrier's inspection, notify the carrier immediately, and file a shipping damage claim.

Although EAW will help in any way possible, it is always the responsibility of the receiving party to file any shipping damage claim. The carrier will help prepare and file this claim.

2.3 Returning Products to EAW

If the loudspeaker must be returned to EAW, contact the EAW Service Department for a Return Authorization (See Chapter 7). Use the original shipping carton and packing materials. If the shipping carton is lost or damaged, contact EAW for a new carton, for which there will be a small charge. EAW will not be responsible for damage caused by inadequate packing when returning the loudspeaker for service.

All units returned must have a factory Return Authorization Number. Any units received without a Return Authorization Number assigned and written prominently on the outside of the carton will be refused.

Chapter 3 Quick Start

This section provides basic installation requirements. Refer to Chapter 5 for detailed instructions.

Module refers to either a DSA230i or DSA250i loudspeaker.

Cluster refers to any of the permissible arrangements of single or multiple DSA230i or DSA250i modules as defined in DSAPilot. Whether they consist of a single or multiple modules, all DSAi clusters function as a single loudspeaker.

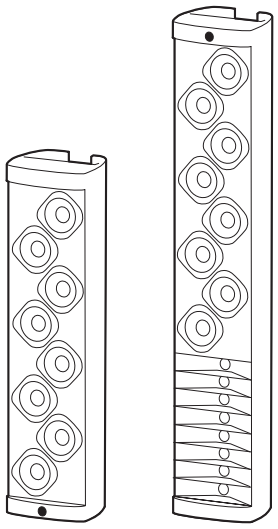


Figure 3.1 DSA230i & DSA250i

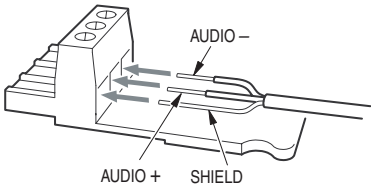


Figure 3.2 Audio Connector

3.1 Description

DSAi modules are variable directivity, self-powered line arrays. EAW's easy-to-use DSAPilot provides computer control for the module's vertical beamwidth pattern. This allows customizing the coverage on-site to fit the application. Modules are controlled via standard EIA-485* or optional CobraNet™/Ethernet networking.

*Also known as RS-485 (Recommended Standard 485)

Model DSA250i is a full range module. Model DSA230i can be employed as a voice-only module or as low frequency module to supplement a DSA250i's low frequency output and pattern control.

3.2 Audio Signal Connection

NOTE: Using DSAPilot, the two input channels may be summed to mono, used separately, or set up for a priority override function: Audio B overrides Audio A. Equalization, compression, and level are separately adjustable for each input. Overall signal delay for each module and cluster is also provided.

Audio A and B (each): 2-conductor shielded audio cable/supplied
Phoenix Contact terminal block plug

3.3 Computer Control Connection

NOTE: Set the EIA-485 Terminate Switch to “ON”. For multiple modules, see Chapter 5.

EIA-485: 2-conductor shielded audio cable/supplied
Phoenix Contact terminal block plug

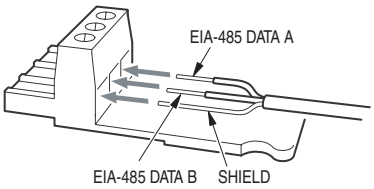


Figure 3.3 EIA-485 Connector

3.4 Daisy Chaining Audio and Computer Signal Between Modules

Distances up to 2 ft / 0.6 m are for connecting multiple modules in a single cluster while distances over 2 ft / 0.6 m are for connecting physically distributed clusters.

Up to 1 ft / 0.3 m: Supplied Cat-5 Signal Link Cable
Connect between Signal Link jacks (Neutrik® EtherCon®) on vertically adjacent modules within a multi-module cluster.

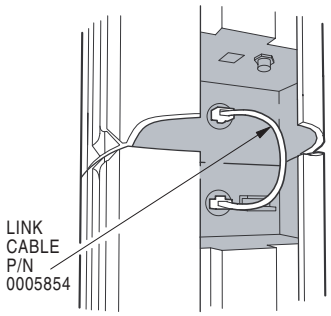


Figure 3.4a Signal Links < 1 ft / 0.3 m

Up to 2 ft / 0.6 m: User-supplied, Cat-5 Ethernet crossover cable
Connect between Signal Link jacks (Neutrik® EtherCon®) on horizontally adjacent modules within a multi-module cluster.

Over 2 ft / 0.6 m: 2-conductor shielded audio cable / supplied Phoenix Contact terminal block plugs

Connect Audio A, Audio B (if used), and EIA-485 in parallel daisy-chain fashion between clusters.

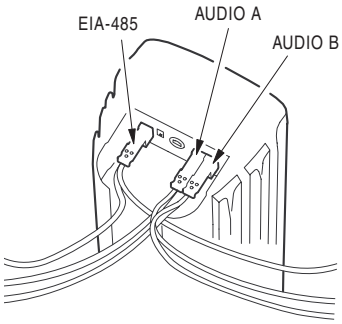


Figure 3.4b Signal Links >2 ft / 0.6 m

3.5 AC Mains Installation

3.5.1 AC MAINS SUPPLY

Provide the module with a 50 Hz or 60 Hz ac mains circuit capable of:

	100 V to 120 V	220 V to 240 V
DSA230i and DSA250i	4 A	4 A

Before applying power, ensure that the ac mains voltage matches the voltage rating on the module.

DANGER: DO NOT APPLY 230 V MAINS POWER IF THE VOLTAGE RATING ON THE MODULE IS 115 V. IMMEDIATE AND CATASTROPHIC DAMAGE TO THE MODULE WILL RESULT AND MAY CAUSE A FIRE HAZARD, SERIOUS PERSONAL INJURY, OR DEATH.

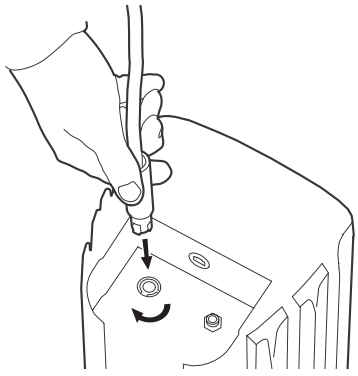


Figure 3.5 Connecting AC Mains

3.5.2 AC MAINS CABLE

Supply and connect #14 AWG / 2.5 mm power cable and appropriate ac mains plug to the supplied Neutrik/PowerCon® connector.

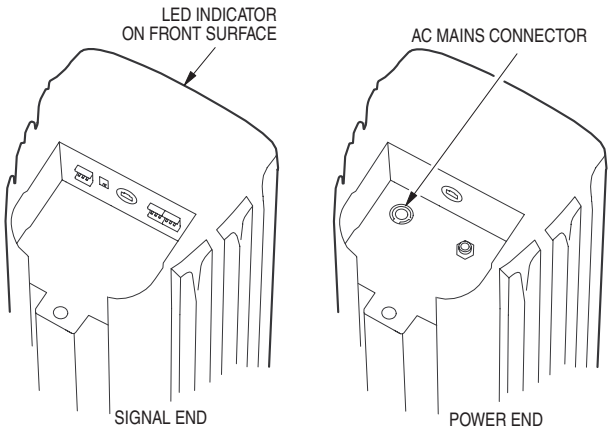


Figure 3.6 Signal End / Power End

3.6 Physical Installation

3.6.1 ORIENTATION

1. When installing the enclosure, there is a correct "top" and "bottom". This cannot be assumed from the physical appearance. Instead, orientation depends on application and desired acoustical performance determined using DSAPilot.

2. Ensure the enclosure is oriented correctly by verifying which ends are supposed to be the top and bottom for the intended application. The Signal End is the end with the identification LED, visible on one end of the front of the enclosure. The Power End has the ac mains connector.

NOTE: The desired coverage cannot be achieved if the enclosure is incorrectly oriented.

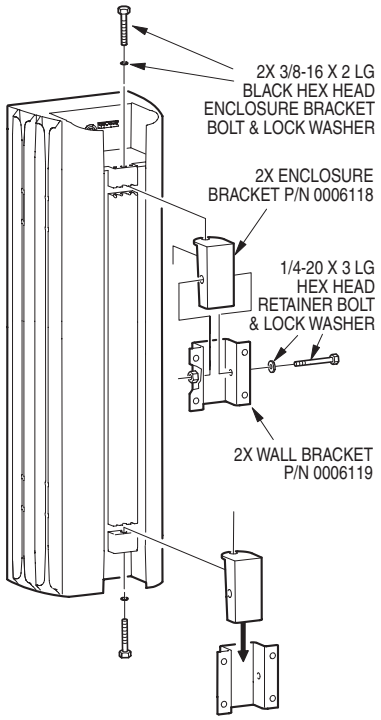


Figure 3.6.2a Bracket Installation

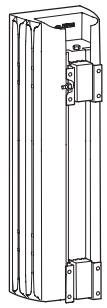


Figure 3.6.2b Installed Bracket

3.6.2 MOUNTING

WARNING: Comply with all installation warnings in Section 5.6.1.

The DSAi Series modules are normally intended to be flush-mounted against a vertical surface capable of supporting their weight.

1. Using the template printed on the shipping box, locate and position the supplied Wall Brackets to structure.

2. Attach the Wall Brackets to structure. You must provide attachment hardware and ensure the attachment method and structure are capable of supporting the intended load. Position the Wall Bracket weld nuts left or right to allow clearance for later insertion of the Retainer Bolt.

3. Ensuring they are oriented properly, install the two Enclosure Brackets on the module. Insert and hand-tighten the supplied 3/8-16 Enclosure Bracket Bolt and Lock Washer for each Enclosure Bracket.

4. Lift the enclosure onto the installed Wall Brackets.

   WARNING: Use at least two people for lifting enclosure onto the brackets.

5. Insert and snugly tighten at least one of the supplied 1/4-20 Retainer Bolt and Lock Washer through the side of either of the Wall and Enclosure Brackets. This prevents the enclosure from being lifted off the Wall Brackets.

6. Securely tighten each 3/8-16 Enclosure Bracket Bolt to lock the enclosure at the desired horizontal angle.

3.7 Signal Processing

The vertical coverage is determined by programming the module's digital signal processing.

Use DSAPilot to determine the desired coverage. DSAPilot calculates and optimizes the signal processing required to achieve the desired results.

High pass/low pass filters, parametric EQ, delay, and gain are user adjustable for each of the two inputs.

Figure 3.7a DSAPilot Main

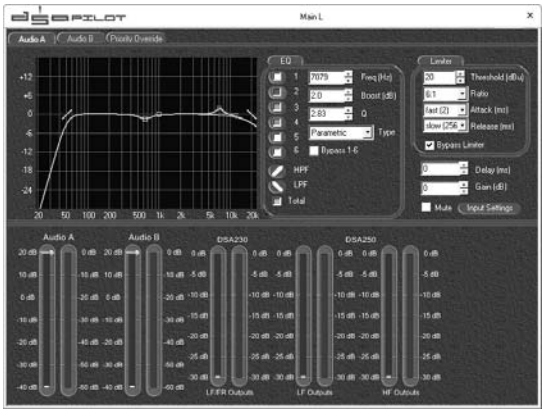


Figure 3.7c DSAPilot EQ / Monitor

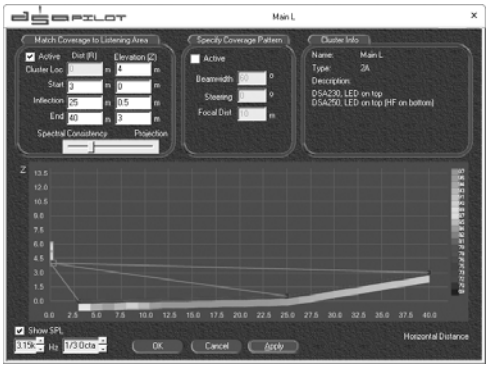


Figure 3.7b DSAPilot Steering

Chapter 4 Description

4.1 System Overview

DSAi modules, are variable directivity, self-powered line arrays. Their vertical beamwidth is determined by the settings of an internal DSP (digital signal processor) and power amplifier for each transducer. This provides complete, on-site control over the range of possible vertical beamwidth patterns.

EAW's Windows-based DSAPilot is used to set the coverage required for each module or cluster. The user-friendly DSAPilot optimizes the required signal processing for the design. This data is then uploaded to the DSAi Series modules in the system. DSAPilot normally communicates with the modules using EIA-485*. An optional CobraNet network interface is available.

*Formerly known as RS-485 (Recommended Standard 485)

4.1.1 DSAi SERIES MODELS

DSA250i: Full range, 2-way, module
DSA230i: Low frequency and voice-only module

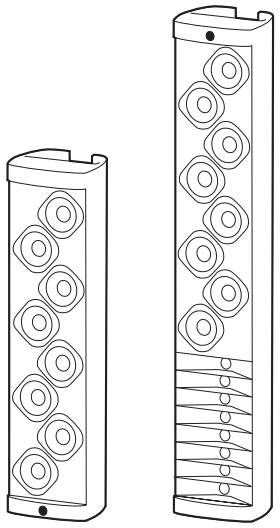


Figure 4.1.1 DSA250i & DSA230i

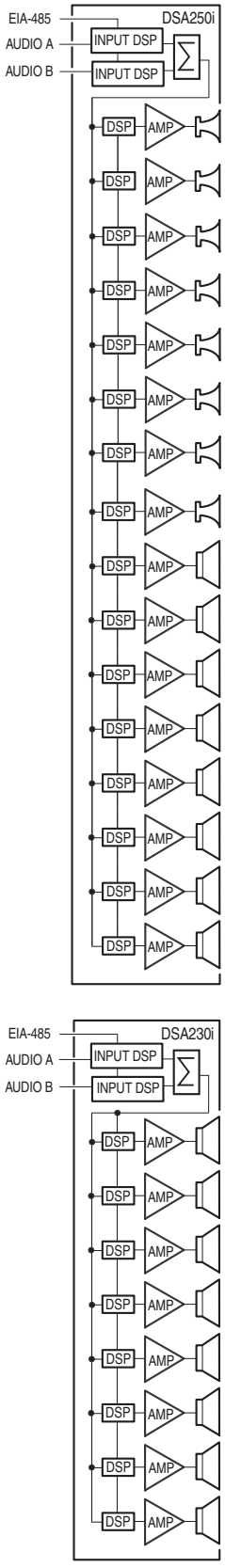


Figure 4.1.4 DSAi Block Diagrams

4.1.2 ACOUSTICAL BENEFITS

Each module can be electronically adjusted on-site to direct sound primarily where needed. Unwanted sound reflections from room surfaces can be reduced, improving the direct to reverberant sound ratio. This, in turn, can significantly increase speech intelligibility. Asymmetrical pattern control can provide consistent SPL in situations with high near-to-far listener distance ratios. User-adjustable level control, equalization, and compression are provided on each of the two audio inputs. Signal delay is provided for multiple module locations.

4.1.3 PHYSICAL BENEFITS

The DSAi Series modules are physically narrow and quite shallow, providing a low profile to reduce their impact on architecture. Their normal mounting position is specifically designed to be flat against a vertical surface. This considerably reduces installation complexity. Several modules to be easily arrayed in one location as a cluster. This affords additional capabilities including higher output, extremely narrow vertical coverage, extended pattern control, greater LF output.

DSAi Series enclosures are constructed of a powder-coated, extruded aluminum body (also used as the amplifier heat sink), high-impact polystyrene end caps, a thick PVC baffle, and a finely perforated steel grille. This construction is designed for years of trouble-free use. The appearance is designed to blend attractively with a variety of architecture. The grille is powder-coated steel, with a perforation style that appears similar to a cloth grille at typical in-use distances. Installation hardware is included to facilitate installation in most applications.

4.1.4 ELECTRICAL BENEFITS

Built in digital signal processing, power amplification, and protective limiting significantly reduces equipment costs, space, installation, and set-up adjustments. Cabling is limited to providing ac mains, line level audio, and computer control signals. EIA-485 or optional CobraNet/Ethernet networking technology allows all modules in a project to be adjusted and controlled from one computer. EIA-485 network topology was chosen as the supplied default because it is easy to implement. It is also unique in allowing multiple network nodes to communicate bi-directionally over a single pair of twisted wires. No other network standard combines this capability with equivalent noise rejection, data rate, cable length, and general robustness.

4.2 Features

4.2.1 ACOUSTICAL

Vertical beamwidth is software controlled on-site to fit the application

- Wide 120 degree fixed horizontal beamwidth.
- Pre-determined cluster configurations provide a wide range of capabilities.
- DSA250i full-range module has eight 4 in LF drivers, eight 1 in horn-loaded HF drivers.
- DSA230i low frequency or voice-only module has eight 4 in LF drivers.

· Full frequency response and high output for music applications.
· Extended pattern control and higher outputs at lower frequencies using additional DSA230is.
· Exceptional intelligibility for reverberant rooms.

4.2.2 ELECTRONIC

· Self-powered requiring wiring for ac power, line level audio, and computer control.
· No amplifier or processing racks needed, reducing space and cost.
· Individual amplifier and DSP for each transducer.
· Convection cooled electronics eliminates noisy cooling fans.
· Built-in driver protection provides high reliability.
· Two audio inputs allow summed stereo or priority announcement override capability.
· Electronically balanced inputs maximize the signal to noise ratio.

4.2.3 COMPUTER CONTROL

· User-friendly DSAPilot software easily creates desired vertical coverage patterns.
· DSP adjusted and optimized by DSAPilot for plug and play setup.
· User adjustable input EQ, signal delay, level, HPF/LPF, and compression for each cluster.
· Computer can be disconnected for no-tamper operation.
· Computer can be left connected for monitoring purposes.

4.2.4 NETWORKING

· EIA-485 network for remote PC operation and computer control.
· Analog audio and control signals can be daisy-chained to multiple modules.
· Cat-5 Link Cable links adjacent modules.
· Optional CobraNet interface for digital distribution of audio and computer control via Ethernet.
· Provision for back up audio/computer communications using a redundant Ethernet network, when using CobraNet.

4.2.5 PHYSICAL

· Phoenix Contact and Neutrik EtherCon and PowerCon connectors for reliable connections.
· Low weight (<100 lb / 45 kg) reduces structural mounting requirements.
· Mount vertically while providing asymmetrical down-angle coverage
· Brackets supplied for mounting to vertical surfaces.
· Mounting allows +/-15 degree horizontal rotation of the enclosure.
· Optional hardware for suspending enclosures
  ·Elegant enclosure design and neutral color blends with a variety of architecture.
  ·Rear enclosure extrusion channels can be used to route cabling.

4.3 Applications

The DSAi Series provides a significant advance for cost-effective implementation of line array technology in a variety of applications. As is typical for line arrays, the DSAi Series is an excellent choice for voice-only applications. However, unlike typical voice-only line arrays, the DSAi Series can also provide the wide frequency range, fidelity, and output levels needed for excellent music reproduction. This significantly extends its range of applications to a wide range of venue types including theaters, theme parks, retail spaces, and government facilities. Its unique capabilities, however, make it particularly well suited to applications that present a challenging acoustical, physical, or aesthetic environment.

The DSAi Series is ideal for a variety of venues where achieving good vocal intelligibility is critical. These include theatres, auditoria, houses of worship, theme parks, retail spaces, government facilities, lecture halls, large conference rooms, museums, and shopping malls. It can solve acoustically difficult challenges in reverberant environments such as cathedrals, concert halls, ballrooms, rail/air/sea terminals, large lobbies, and athletic buildings. Its low profile further enhances its applicability in aesthetically sensitive environments.

Designers can use DSAi modules in a variety of factory-supported DSAi cluster configurations to meet specific output or directivity needs. For voice-only applications, single DSA250i modules can be placed to provide adequate output and horizontal coverage. In these cases, designers enjoy control of the vertical pattern throughout the vocal range. For broadband music reproduction, the addition of a DSA230i to each DSA250i will extend pattern control well into the LF range and provide additional LF output.

Each DSAi module has a FAULT DETECT interface allowing an external supervisory circuit to monitor the module's operational status. Multiple DSAi modules can be connected to a single supervisory circuit so that any one module will trigger the supervisory circuit's fault alarm.

4.4 Engineering Design

The core acoustical design of the DSAi Series dates back to the late 1930s in Harry Olson’s book, “Acoustical Engineering”. He showed that, by using different signal delays on the input to each transducer in a simple line array, the array’s main output lobe could be effectively “steered”. While this concept has certainly been used before, the design of the DSAi Series goes far beyond this simple concept.

Rather than simply steering the vertical lobe, the shape of this lobe in the vertical plane is also made variable. This allows changing the depth of the coverage to precisely fit the listening area thereby reducing troublesome near-to-far SPL differences.

The digital signal processing involves parametric equalization, micro signal delays, sophisticated frequency filtering, gain, and limiting. These parameters are individually adjusted by DSAPilot for each transducer in each module. The available DSP resources provide a broad range of possible coverage patterns and SPL control over distance as well as the voicing required for exceptional music reproduction.

Multiple DSAi modules arrayed as a cluster at a single location allows a greater range of beamwidths, SPL, pattern control, and low frequency output than a single DSAi module can provide. DSAPilot treats the cluster as if it were a single loudspeaker, precluding the complexities normally associated with designing and tuning clusters.

The major advantage of DSAi its radiation pattern which is quite different than simply angling down a loudspeaker with the same horizontal and vertical beamwidths. The example EASE plots illustrate the differences. While the angled loudspeaker is a line array, the behavior of a conventional horn would be quite similar.

The radiation pattern of the angled loudspeaker has several problems that would reduce intelligibility. There is inadequate coverage across the front area of the room and it focuses a distinct line of energy along the front and side walls at nearly the same loudness as the floor seating area. The energy reflecting off these surfaces would arrive at many listeners late enough to impair intelligibility. It would also be reflected around to other surfaces, energizing the reverberant field and decreasing the direct-to-reverberant ratio. Some of these reflections add to the direct sound causing the highest intensity sound to be at the rear, even though further from the loudspeaker.

By contrast, the radiation pattern of the electronically steered DSAi is far more consistent across the entire floor area. Not only is less energy directed at the walls, but the reflection pattern would be quite different, primarily directed down towards floor or to nearby listeners, arriving early enough to actually enhance intelligibility.

DSAi's steering algorithms are also designed to provide a smooth off-axis pattern instead of the distinct and undesirable off-axis lobes characteristic of line arrays. Such lobes can be seen in the conventional line array as the V-shaped pattern of spots in front of the stage.

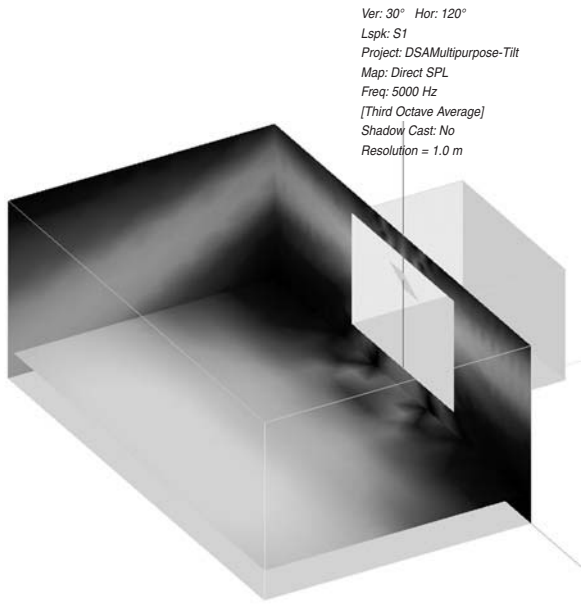


Figure 4.4a Angled Radiation Pattern

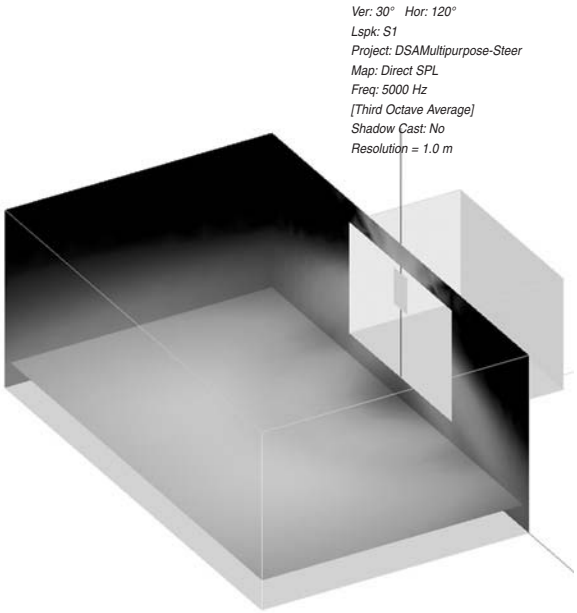


Figure 4.4b DSAi Steered Radiation Pattern

4.5 DSAPilot

DSAPilot, used to set the module signal processing parameters, is based on software originally developed by EAW engineers for the KF750, KF760, and, in particular, the KF900 Series products. These products required precise but variable pattern control and a high degree of fidelity for speech and music in projects that range from small houses of worship to the newest super-stadiums. Sophisticated mathematical algorithms were developed to calculate the signal processing to achieve these results for both multiple transducers and multiple module clusters. Thoroughly tested and refined in successful, real-world applications, these techniques have been applied to the DSAi Series to achieve the same high degree of pattern control, musicality, and ease of setup.

Though highly complex, DSAPilot's mathematics work behind the scenes. DSAPilot is highly user-friendly, making the signal processing adjustments deceptively simple. In fact, no acoustical knowledge is required to set up and adjust DSAi Series modules. The only information needed for DSAPilot to perform its magic is the module mounting location, and desired coverage area.

4.6 Low Frequency Performance

While the DSA250i is designed as a full-range module, addition of the companion DSA230i increases directionality and output at lower frequencies. Directional control is increased in classical line array fashion by extending the length of the overall array by mounting the DSA230i in line with a DSA250i to form a longer line of low frequency transducers. In addition, the increased number of low frequency transducers couple to increase the low frequency output capability.

4.7 Comparison to Traditional Products

A major benefit of the DSAi Series is achieving desired down angle coverage from a line source that is mounted flat to a vertical surface. The inclusion of power amplifiers and dedicated signal processing to each transducer provide the DSAi Series with performance and capabilities well beyond those of typical multi-way loudspeakers and traditional, voice-range line arrays. The DSAi Series can provide much better directional control, higher output, and wider frequency response. Significantly smaller sizes and weights, plus straightforward mounting and wiring options pay additional benefits in reduced installation costs and operation. The flexibility of DSAPilot to automatically optimize the acoustical performance for multiple DSAi Series modules in a single larger space further enhances their advantage over traditional solutions.

4.8 Designing DSAi Systems

DSAi modules can be used individually, in multiples, or in various cluster configurations to satisfy a wide range of design requirements. By using different configurations, DSAi performance can be varied according to the type of audio program, the frequency range for the vertical control desired, the maximum output levels, the audience location relative to the module, and for meeting the requirements for special applications.

Chapter 5 Installation

This chapter details the requirements for installation. Specific details may require some variation depending on the particular situation. However, the basic requirements are the same in all cases.

Module refers to either a DSA230i or DSA250i. Cluster refers to any of the permissible arrangements of single or multiple DSA230i or DSA250i modules as defined in DSAPilot. Whether they consist of a single or multiple modules, all DSAi clusters function as a single loudspeaker.

5.1 Analog Audio and EIA-485 Computer Control

This section details the electrical requirements for installing the module. Specific cabling details may require some variation depending on the particular situation. However, the basic requirements are the same in all cases.

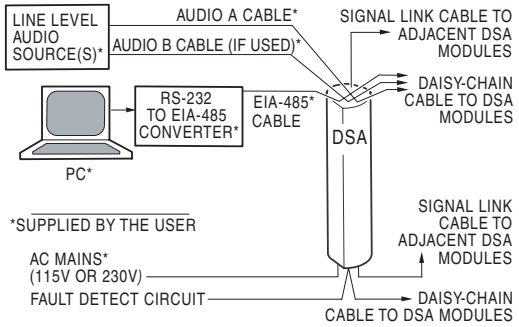


Figure 5.1 Electrical Block Diagram

Basic electrical installation tasks include:

Audio signal connection:
This can be standard analog (Section 5.1.2) or digital using CobraNet[TM] (Section 5.2)

Computer control connection:
This can be EIA-485 (Section 5.1.3) or CobraNet (Section 5.2)

Supervisory relay connection:
As required to monitor the module status

There are several possible types and combinations for the audio and computer control connections. This and the following section cover the most common connections. For other combinations and details about multiple module wiring configurations see Appendix 8.6.

5.1.1 CABLE ROUTING CONSIDERATIONS

The configuration and orientation of the modules will determine where signal, computer, and ac mains cabling must be connected to the modules. For certain cluster configurations it may be necessary to route cabling from one end of a module to another.

The main cable routing method is to use the channels in the heat sink extrusion that forms the rear of the DSA250i and DSA230i enclosures. These channels are intended to be used to route and conceal cabling the length of the enclosure as required. In this way, single wall outlet locations for audio, computer, and ac mains can easily service a single module or cluster.

To facilitate cable routing, clusters have been arranged, where possible, so the Power Ends of the enclosures are adjacent. This minimizes the routing of ac mains cables, which are typically larger and may be more difficult to thread into the extrusion than signal cables.

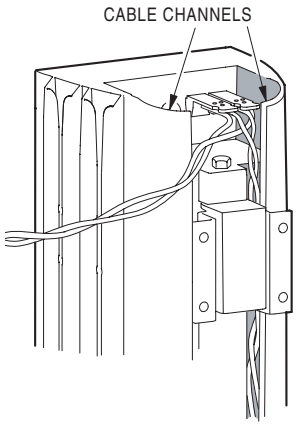


Figure 5.1.1 Cable Channels

5.1.2 AUDIO SIGNAL CONNECTION

See Appendix 8.6 for details about multiple module wiring configurations.

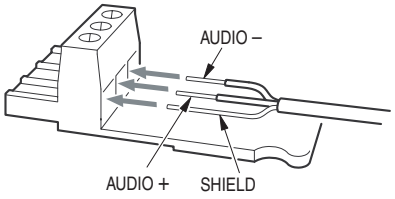


Figure 5.1.2 Audio A & Audio B

CobraNet:	Skip to Section 5.2 if using CobraNet for distribution of the audio and control signals.
Audio A or Audio B:	2-conductor twisted pair, shielded, audio cable connected to supplied 3-pin Phoenix Contact Terminal Plug and to the line level audio signal source. Nominal level: 0 dBu / 0.775 V rms. Recommended Conductor Gauge: 24 AWG to 18 AWG / 0.2 mm to 1 mm
Audio A and Audio B:	As above but 4-conductor twisted pairs

5.1.3 COMPUTER CONTROL CONNECTION

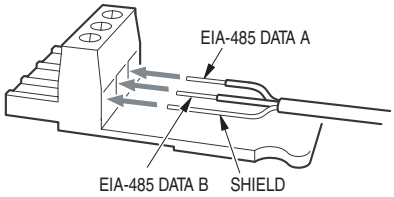


Figure 5.1.3 EIA-485 Connector

CobraNet:	Skip to Section 5.2 if using CobraNet for distribution of the audio and control signals.
EIA-485 (formerly RS-485):	2-conductor twisted pair, shielded, cable connected to supplied 3-pin Phoenix Contact Terminal Plug and to EIA-485 port for the computer. Recommended Conductor Gauge: 24 AWG to 18 AWG / 0.2 mm to 1 mm

NOTES:

1. Do not combine EIA-485 and audio signals in the same cable.

2. An EIA-485 converter is required to convert a PC's RS-232 or USB port to a 2-wire EIA-485 port. While there are many converter products available, contact EAW's Application Support Group (See Section 7.3) for recommendations about suitable models.

3. EIA-485 cabling has special requirements and limitations. See Appendix 8.3 for details.

5.1.4 DAISY CHAINING COMPUTER AND AUDIO SIGNALS WITHIN CLUSTERS WITH MULTIPLE MODULES

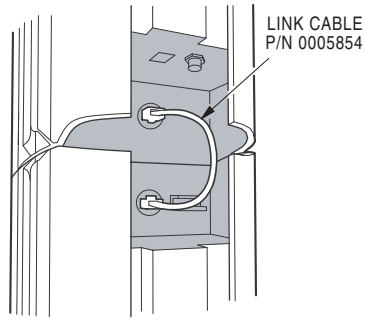


Figure 5.1.4 Linking < 1 ft / 0.3 m

NOTE: The Signal Link jacks carry both computer and audio signals. The cable between the Signal Link jacks must be wired as a standard Ethernet crossover cable. A cable wired as a standard Ethernet straight through cable will not work.

1. Up to 1 ft / 0.3 m between adjacent over/under modules in a cluster:
   Supplied Cat-5 Signal Link Cable
   Connect between unused Signal Link jacks (Neutrik EtherCon) on vertically adjacent ends of the modules.

2. Up to 2 ft / 0.6 m between adjacent side-by-side modules in a cluster
User-supplied Cat-5 crossover cable.
Connect between unused Signal Link jacks (Neutrik EtherCon) on horizontally adjacent ends of the modules.

Crossover Cable Wiring

STANDARD END PINS	1	2	3	4	5	6	7	8
CROSSOVER END PINS	3	6	1	4	5	2	7	8

5.1.5 DAISY CHAINING COMPUTER AND AUDIO SIGNALS BETWEEN CLUSTERS

Any distance (within EIA-485 limitations) between clusters:
2-conductor shielded cable
Audio A, Audio B, and EIA-485

Connect in parallel to the incoming signal cables on one module in the first cluster and connect to the same signal ports on one module in the next cluster. Use the supplied 3-pin Phoenix Contact terminal plugs.

Recommended Conductor Gauge:
24 AWG to 18 AWG / 0.2 mm to 1 mm

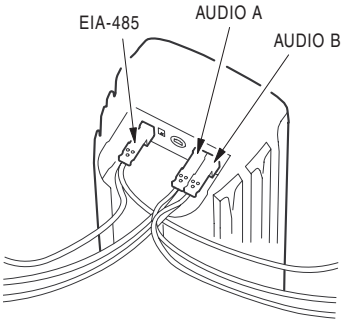


Figure 5.1.5 Linking > 2 ft / 0.6 m

5.1.6 EIA-485 TERMINATE SWITCH

EIA-485 termination has special requirements and limitations. See Appendix 8.3 for details.
Single Cluster:

Set the EIA-485 Terminate Switch on the module (connected via the Phoenix connector) to “ON”.

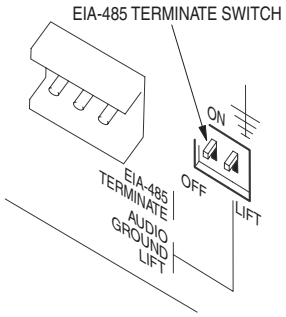


Figure 5.1.6a EIA-485 Terminate Switch

Multiple Clusters:

Set the EIA-485 Terminate Switch to “ON” ONLY on the module (connected via the Phoenix connector) at the end of the EIA-485 cable run furthest from the computer. Set all other Terminate Switches to “OFF”.

CAUTION: Engaging the EIA-485 Terminate Switch on more than one module on the EIA-485 cable run can cause intermittent or nonexistent communications.

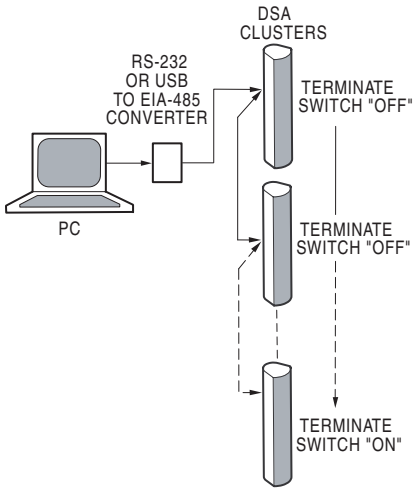


Figure 5.1.6b EIA-485 Network Diagram

5.2 CobraNet™ Audio and Computer Control

See Appendix 8.6 for details about multiple module wiring configurations.

This section provides details about using the optional CobraNet technology for distribution of audio and computer control signals.

5.2.1 DESCRIPTION

CobraNet is a combination software, hardware, and network protocol that can replace the audio or both the audio and computer connections described in Section 5.1. Digitized audio and computer control is distributed by a CAT-5 (or better) cable to each module. The network infrastructure must be designed using standard IEEE 802.3u 100BASE-T Fast Ethernet hardware. The network will not function properly using 10BASE-T technology.

DSAi requires that CobraNet be set to use multicast bundles. The DSAPilot Help file details how to set the DSAi bundle and channel number for each DSAi cluster.

> NOTE: If using CobraNet audio with EIA-485 computer control, use DSAPilot to configure the CobraNet options to CobraNet for Audio only. This disables the connection from the CobraNet card to the EIA-485 bus, thus preventing a control loop through the CobraNet connections.

5.2.2 COBRANET IS USUALLY DESIRABLE TO USE WHEN

- A star cable configuration is easier to implement for multiple modules
- Audio is provided via CobraNet and computer control via EIA-485
- A high degree of noise immunity is needed for the audio
- Future system expansion is likely
- Long cable runs that permit fiber optic cabling
- Other CobraNet-capable products are used in the same installation
- The number of modules and clusters exceeds 32
- The audio source(s) have digital outputs

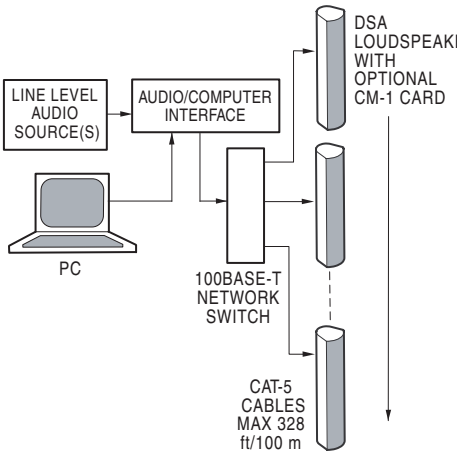


Figure 5.2.3 Basic CobraNet Diagram

5.2.3 ADDITIONAL EQUIPMENT YOU MUST SUPPLY FOR COBRANET

- Module interface:
  EAW CM-1 CobraNet Interface Card (P/N 0005987) for each DSAi Series module and each module within a DSAi cluster
- Audio/Computer interface:
  Converts signals to CobraNet protocol
- Ethernet switch or hub:
  For networking multiple modules over Ethernet

5.2.4 CABLING

A CAT-5 or better cable with RJ-45-compatible connectors is required for each module.

> NOTE: Ethernet cable length is limited by specification to 328 ft / 100 m. Longer runs are possible using network hubs or switches as repeaters or by conversion to fiber optic cable.

5.2.5 AUDIO/COMPUTER INTERFACE

Audio and RS-232 (for DSAPilot control signals) must be converted to the CobraNet protocol and connected to the network via an RJ-45 Ethernet port. Products that do this are available from several manufacturers. Your choice will depend, in part, on how many and what form of audio signals (digital or analog) you need to distribute.

Manufacturers of converters include:
Peavey, QSC, Rane, Symetrix, Whirlwind, and Yamaha.

5.2.6 MODULE INTERFACE

An optional EAW CM-1 CobraNet Interface Card must be installed in the slot provided in the module. To do this, see installation instructions that accompany the CM-1.

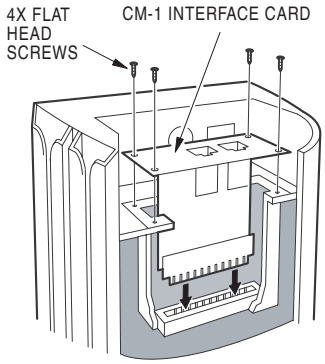


Figure 5.2.6 CM-1 Interface Card (See Installation Instructions with Card)

Connect the PRIMARY RJ-45 Ethernet connector to the Ethernet cable. The SECONDARY RJ-45 Ethernet connector on the CM-1 is for connecting to a second, redundant Ethernet network. This would be designed as a back-up network that automatically takes over in the event of failure in the primary network.

The digital audio received by the CM-1 connects directly to the loudspeaker's digital signal processing. It is converted back to analog at the inputs to the internal power amplifiers.

5.2.7 MULTIPLE MODULES

To connect multiple modules to the network, the Ethernet output on the audio/computer interface must connect to a network switch or hub. A network switch is normally recommended. The switch must have an Ethernet port for each module which also means each module in a DSAi cluster.

A CAT-5 cable is required from the Ethernet port on the CM-1 Interface Card in each module to its port on the network switch. For networks requiring cable runs longer than 328 ft / 100 m, a repeater network or fiber optic cabling is recommended. Do NOT mix hubs and switches on a repeater network. Network switches and hubs are available through most computer retailers.

5.2.8 SUPPORT FOR COBRANET / ETHERNET

See Sections 8.4 and 8.5 for support information for Ethernet and CobraNet.

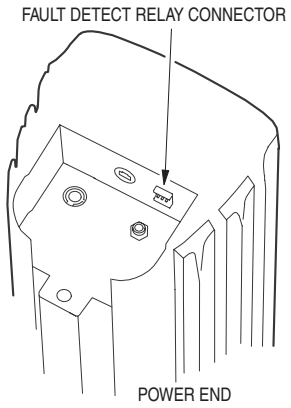
5.3 Fault Detect - Supervisory Monitoring

This section details how to remotely monitor the operating status of a DSAi module. This is done by connecting a monitoring circuit, better known in the trade as a supervisory circuit, to the FAULT DETECT Form C relay integral to each DSAi module. The power to the FAULT DETECT relay coil is controlled by monitoring circuits that report the operating status of several critical DSAi functions. When any one of the monitoring circuits reports an out of tolerance operating status, the FAULT DETECT relay is powered off. The SPDT (single-pole, double throw) dry contacts are normally used to make or break power to an annunciator.

When a fault occurs, use DSAPilot's "Diagnostics" function to help determine the specific problem. See the DSAPilot Help file for information about Diagnostics.

IMPORTANT: Fault conditions are determined independently within each DSAi module. Therefore, a supervisory circuit must connect to each individual module, including each module within a DSAi Cluster.

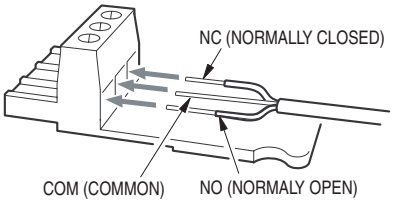
5.3.1 FAULT DETECT RELAY OPERATION



The status of critical operating functions is continually monitored within each DSAi module. When a fault condition is detected for any of these functions within a DSAi module, its FAULT DETECT relay is powered off. After a fault is detected, it takes the monitoring circuitry approximately 2 seconds to power down the relay.

- Excessive Amplifier Temperature: Above 167° F / 75° C.
- Bad Amplifier Channel: Any amplifier channel reports its status as bad.
- Low Battery: The backup battery reports its status as low. This could lead to a potential loss of the modules DSP settings.
- Bad DSP: The DSP reports failure for any reason that interrupts the audio signal.
- No ac mains: The ac mains power is disconnected or lost.

5.3.2 FAULT DETECT CONNECTIONS



NOTE: Normally only 2 terminals are used (COM & NO or NC)

Figure 5.3.2 Fault Detect Connection

The FAULT DETECT is a Form C relay, the terminals defined by their state when the DSAi is powered off:

NO (Normally Open)
COM (Common)
NC (Normally Closed).

Maximum ac and dc relay contact rating:

1 A @ 30 V

Conductor Gauge:

24 AWG to 18 AWG / 0.2 mm to 1 mm

The type of wiring or cable required will depend on the supervisory circuit requirements.

5.3.3 SUPERVISORY CIRCUITS

While there are a number of possible supervisory circuits, the normal method is to use the relay contacts to connect or disconnect power to an annunciator. This can be a light, audible alarm, computer interface, or other indicator. A light is used in the example diagrams.

1. Single DSAi module or individually monitored modules:

Annunciator ON for a fault condition:
Connect to the NC and COM terminals.

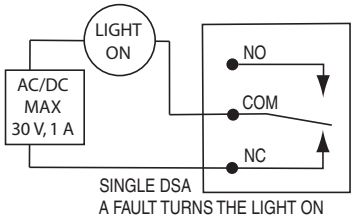


Figure 5.3.3a Single DSAi Fault ON

Annunciator OFF for a fault condition:
Connect to the NO and COM terminals

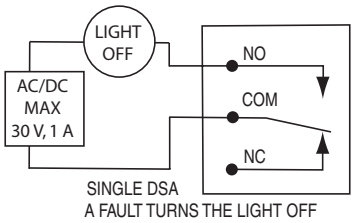


Figure 5.3.3b Single DSAi Fault OFF

2. Multiple DSAi modules:

Annunciator ON for a fault condition:
Connect to the NC and COM terminals.
The terminals are wired in parallel to each module.

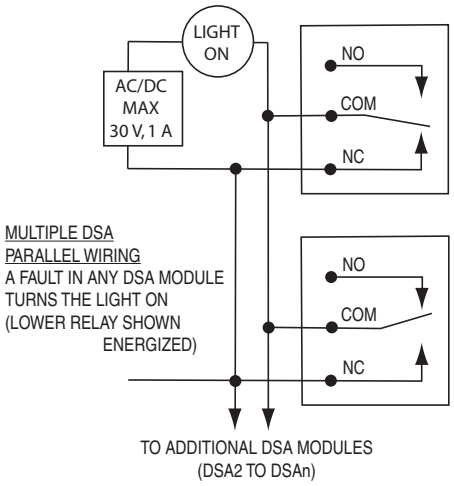


Figure 5.3.3c Multiple DSAi Fault ON

Annunciator OFF for a fault condition:
Connect to the NO and COM terminals.
The terminals are wired in series to each module.

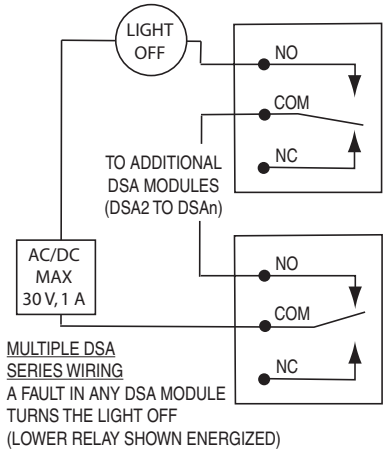


Figure 5.3.3d Multiple DSAi Fault OFF

5.4 AC Mains Power Connection

This section details the requirements for the ac mains which is the ac power connection required by each DSAi module.

5.4.1 AC MAINS SUPPLY

WARNING: Read WARNING under SAFETY INSTRUCTIONS on Page 2.

Each DSAi Series module is rated for a particular nominal ac mains voltage: 115 V or 230 V. Provide the module with 50 Hz or 60 Hz ac mains circuit capable of:

	100 V to 120 V	220 V to 240 V
DSA230i and DSA250i	4 A	4 A

Before applying power, ensure that the ac mains voltage matches the voltage rating on the module.

DANGER: DO NOT APPLY 230 V MAINS POWER IF THE VOLTAGE RATING ON THE MODULE IS 115 V. IMMEDIATE AND CATASTROPHIC DAMAGE TO THE MODULE WILL RESULT AND MAY CAUSE A FIRE HAZARD, SERIOUS PERSONAL INJURY, OR DEATH.

5.4.2 AC MAINS CABLE

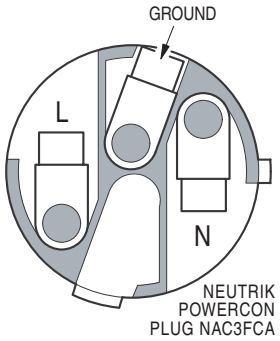


Figure 5.4.2 PowerCon Plug

The supplied Neutrik PowerCon NAC3FCA plug mates with the Neutrik PowerCon NAC3MPA AC MAINS jack on the module. Because of both varying installation and electrical code requirements, neither an ac mains cable nor ac mains supply connection are supplied.

1. Supply and connect a 3-conductor power cable to the supplied PowerCon plug, ensuring a proper ground connection.

2. Supply and attach an appropriate connector for the ac mains connection at the other end.

Recommended Power Cable

Conductor Gauge:	14 AWG / 2.5 mm (limited by PowerCon design)
Cable O.D.:	5 mm to 15 mm (limited by PowerCon design)
Recommended length:	Maximum 25 ft / 8 m (for <2% voltage drop at peak input power)

NOTE: If the power cable is longer than 25 ft / 8 m the voltage drop will increase.

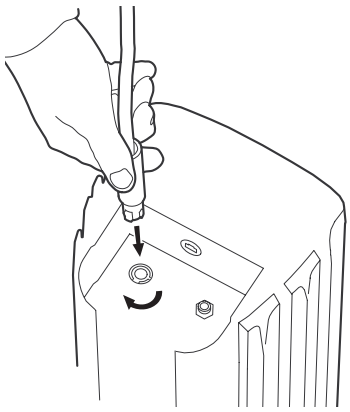


Figure 5.4.3 Connecting AC Mains

5.4.3 POWER ON / OFF

There is NO power on/off switch on DSAi Series modules. A module will be powered on (energized) when connected to an ac mains supply. For about 3 seconds when first powered on, the LED on the Signal End will flash rapidly and the FAULT DETECT relay in the Power End cap will click on and off. This is normal and indicates the electronics are being initialized. The LED should then go off. See Section 6.1.2 for other LED indications.

If it is desired to completely power off (de-energize) the module, a conveniently located ac mains disconnect must be supplied or the power cable must be unplugged from the module or the ac mains supply.

The PowerCon connector is a locking connecter. To lock, twist 1/4 turn clockwise after fully inserting into the jack. It is recommended the connection be made at the module before connection to the ac mains supply.

5.4.4 AC MAINS FUSE

If excessive ac mains input current is detected, an internal fuse can blow. This can occur for a variety of reasons, such as internal failure, excessive ac mains voltage, or excessive amplifier output levels.

If the fuse blows, the fuse must be replaced with a fuse of the correct type and rating as listed below. In the unlikely event the fuse blows again, internal failure is indicated. This will require troubleshooting and repair by a qualified service technician. Do not attempt further use of the module until such repairs are made. See Section 8.2 “Troubleshooting”.

Fuse Type:	AG (0.25 in x 1.25 in) slow-blow
Amperage	4 A

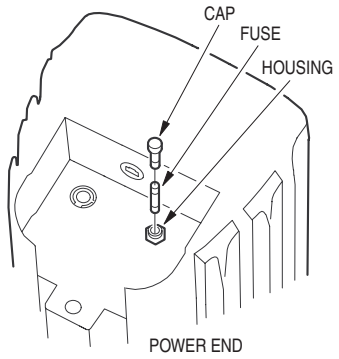


Figure 5.4.4 Fuse

5.5 Grounding

5.5.1 ELECTRICAL GROUND

Ensure that the ac mains grounding conductor in the power cable is properly grounded in accordance with applicable electrical codes.

5.5.2 AUDIO GROUND

The Audio Ground Lift switch may help isolate audio ground loops. This dip switch disconnects the internal audio ground from the chassis. Use this switch as needed for reducing ground loop noise.

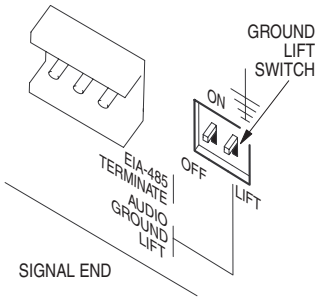


Figure 5.5.2a Ground Lift Switch

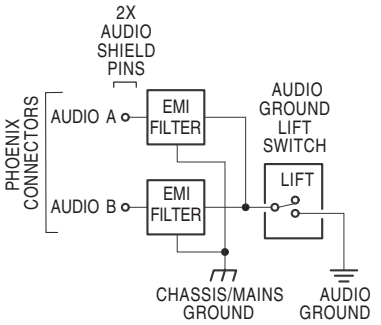


Figure 5.5.2b Ground Lift Function

5.6 Physical Installation

This section details the physical requirements and methods for installing the module. Specific mounting procedures detailed herein may require some variation depending on the particular situation. However, the basic methodology is the same in all cases.

Basic installation tasks include:
Installing the Enclosure and Wall Brackets
Mounting the module

5.6.1 INSTALLATION WARNINGS

DANGER: DSAi SERIES MODULES MUST BE SECURELY MOUNTED TO STRUCTURE CAPABLE OF SUPPORTING THEIR WEIGHT. THE USER IS RESPONSIBLE FOR PROVIDING PROPERLY ENGINEERED ATTACHMENT OF THE SUPPLIED WALL BRACKETS TO STRUCTURE, USING HARDWARE RATED FOR THE LOAD. FAILURE TO FOLLOW THIS WARNING MAY RESULT IN FAILURE OF THE MOUNTING CAUSING THE MODULE TO FALL DOWN, WITH POSSIBLE EQUIPMENT DAMAGE, INJURY, OR DEATH.

DANGER: ONLY PERSONS WITH THE KNOWLEDGE OF PROPER HARDWARE AND INSTALLATION TECHNIQUES REQUIRED SHOULD ATTEMPT TO INSTALL DSAi SERIES MODULES OVERHEAD. FAILURE TO FOLLOW THIS PRECAUTION MAY RESULT IN DAMAGE TO THE EQUIPMENT, INJURY, OR DEATH.

CAUTION: The actual coverage provided by a DSAi Series module will be largely determined by DSAPilot adjusting its signal processing settings. However, the module must still be positioned in a location that is within the possible adjustment range for the desired coverage.

CAUTION: It is physically possible to mount a DSAi Series module either end up. Because of the transducer-specific signal processing, it will NOT provide the desired performance if installed upside down in its intended application.

CAUTION: For DSAi Clusters with two or more modules mounted one over the other, it is recommended to make all cable connections before lifting each module onto the wall brackets. See Sections 5.2 through 5.6. Once the modules are mounted, access to the connectors may be difficult.

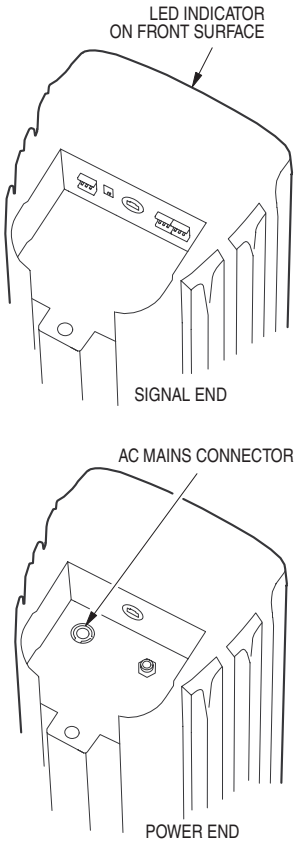


Figure 5.6.2 Signal End / Power End

5.6.2 PHYSICAL ORIENTATION – SIGNAL END / POWER END

The directionality of the DSAi Series modules partly depends on using specific signal delays to each transducer to control its sound arrival to the listeners. As such, DSAPilot makes assumptions about the physical location of each transducer in the enclosure. This means there is a correct “top” and “bottom” to each enclosure that is specific to each application.

The two ends of DSAi modules are referred to as the Signal End and Power End. In addition to this physical difference, there is a built-in LED indicator on the front of the Signal End of each module.

The orientations are shown in the DSAPilot graphics. When activated by the DSAPilot software, this LED can be used to verify both the correct up-down orientation and, when multiple modules are used, the correct location of each. For the DSA250i, the Power End is the end with the HF subsystem and Signal End is the end with the LF subsystem.

5.6.3 MULTIPLE MODULES AND CLUSTER CONFIGURATIONS

CAUTION: Only clusters included in DSAPilot may be used. Any other configurations will result in poor to unusable performance.

Several cluster configurations are shown in Figure 5.6.3. In some applications, tighter pattern control, higher output, or narrower vertical coverage may be desirable. Because of these and other possible requirements, DSAPilot allows several cluster configurations to be used in a single or in multiple locations to achieve various coverage and output results.

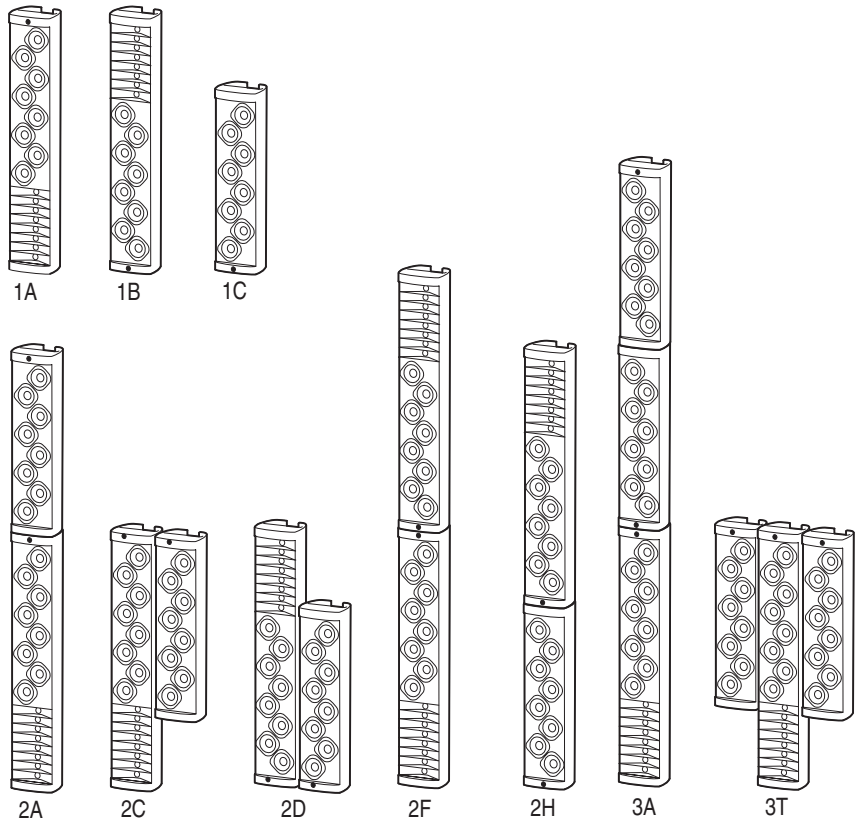


Figure 5.6.3 DSAi Cluster Configurations

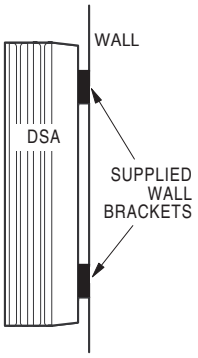


Figure 5.6.4a Wall Mounted

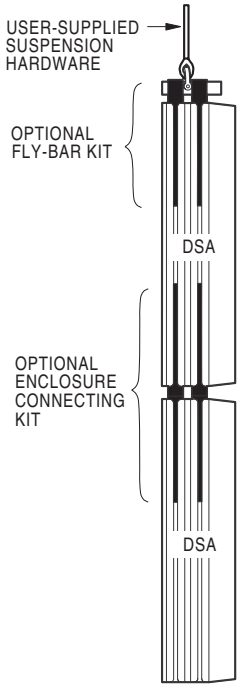


Figure 5.6.4b Suspended

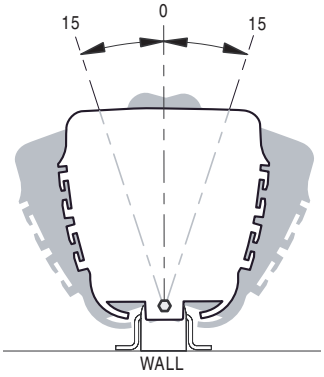


Figure 5.6.5a Horizontal Rotation Single Module

5.6.4 INSTALLATION OPTIONS

Normal Method:
This method is for installing DSAi modules flush-mounted to a vertical wall surface using the supplied brackets. The installation instructions herein apply to this installation method.

Optional Normal Method:
This method is for suspending DSA modules. The optional DSAi Fly-Bar Kit is required for suspension. For suspending more than one module from a single Fly-Bar, the optional Enclosure Connecting Kit is also required. These accessories are supplied with complete instructions for their use.

Alternate Methods:
In some applications, the DSAi modules may require other methods of installation. Please contact EAW for assistance when the normal methods cannot be used. (See Section 7.3)

In all cases, orient each enclosure in the cluster as shown in the DSAPilot diagrams according to the location of the Signal End with the LED.

5.6.5 ANGLING ENCLOSURES

1. Vertical Angle: Normally, the DSAi Series enclosures are designed to be mounted flat to a vertical surface.

2. Horizontal Angle Single Modules: When mounted flat to a vertical surface, the mounting hardware allows the enclosures to be rotated up to +/-15° degrees horizontally, 0° being perpendicular to the wall surface. This allows directing its fixed 120° horizontal coverage anywhere within a 150° arc around the front of the module.

3. Horizontal Angle Over/Under Modules: Always align over/under enclosures so they are aimed in the same direction.

4. Horizontal Angle Side-by-Side Modules: These clusters cannot be rotated horizontally. Always position the DSA250i and DSA230i modules for these clusters so that their aiming axes are perpendicular to the mounting surface.

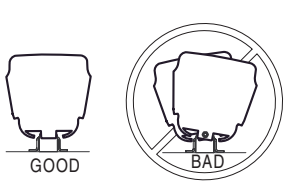


Figure 5.6.5b Horizontal Rotation Over/Under Modules

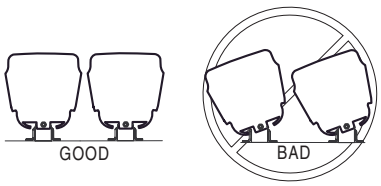


Figure 5.6.5c Horizontal Rotation Side-by-Side Modules

5.6.6 MOUNTING HEIGHT

The elevation entered into DSAPilot refers to distance from the bottom of the module's enclosure or the bottom of the lowest module's enclosure in a multi-module cluster to the floor below. Thus, the mounting height is the same as the elevation in DSAPilot.

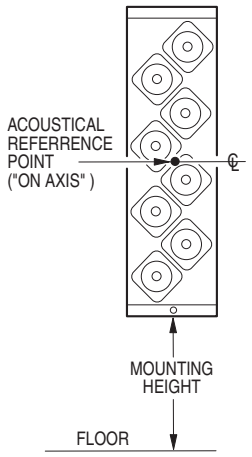


Figure 5.6.6 Mounting Height

5.6.7 WALL BRACKET INSTALLATION

DANGER: ONLY PERSONS WITH THE KNOWLEDGE OF PROPER HARDWARE AND INSTALLATION TECHNIQUES REQUIRED SHOULD ATTEMPT TO INSTALL DSAi SERIES MODULES OVERHEAD. FAILURE TO FOLLOW THIS PRECAUTION MAY RESULT IN DAMAGE TO THE EQUIPMENT, INJURY, OR DEATH.

The supplied Wall Brackets are designed for attachment of the module enclosure to a wall or other vertical surface. Ensure both the hardware used to attach to structure and the structure itself are capable of supporting the load with a design factor that meets applicable building codes.

See Mechanical Drawings in Chapter 9 for weights.

Using the supplied Wall Bracket Mounting Template or exact measurements, locate the four mounting points required to attach each supplied Wall Bracket to the supporting structure. Mounting templates are provided on the shipping-carton and CD-ROM. A bracket template is shown in chapter 9. Ensure that these mounting points are plumb and square to each other so the enclosure will be exactly vertical when installed. Out of plumb and/or square Wall Brackets can prevent proper engagement with the Enclosure Brackets.

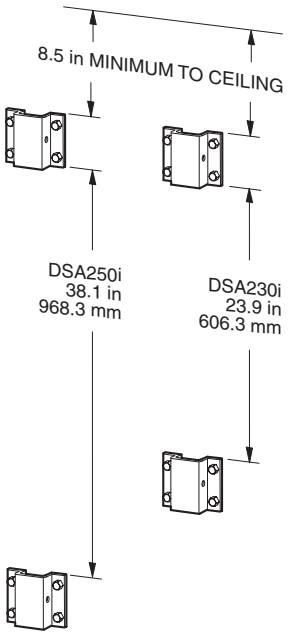


Figure 5.6.7a Wall Bracket

Critical Dimensions:

1. Spacing between the Wall Brackets for a single module must be within 0.1 in / 3 mm of the dimensions in Figure 5.6.7a. In order to lift a module onto its wall brackets, spacing between the top wall bracket and ceiling, or other overhead obstruction, must be 8.5 inches minimum.

   NOTE: 8.5 inches allows only 0.25 inches extra clearance.

2. Spacing between the Wall Brackets for modules mounted over-under fashion must be 4.9 inches.

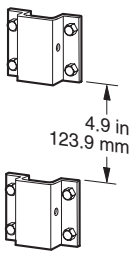


Figure 5.6.7b Over-Under Spacing

3. Spacing between the Wall Brackets for modules mounted side by side must be 5.4 inches.

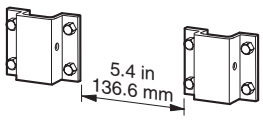


Figure 5.6.7c Side-By-Side Spacing

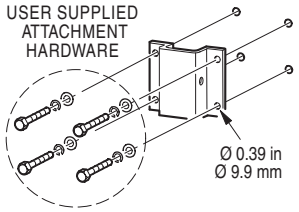


Figure 5.6.7d Wall Bracket Attachment (For illustration purpose only. Attachment hardware selection is installer's responsibility.)

4. Provide attachment hardware and secure the supplied Wall Brackets to the mounting structure, complying with all Danger and Caution notes in Section 5.6.1.

NOTE: The Wall Brackets have a weld nut on one side. Be sure to locate this weld nut to the right or left such that the Retainer Bolt can be inserted into the opposite side of the Wall Bracket after the module is mounted.

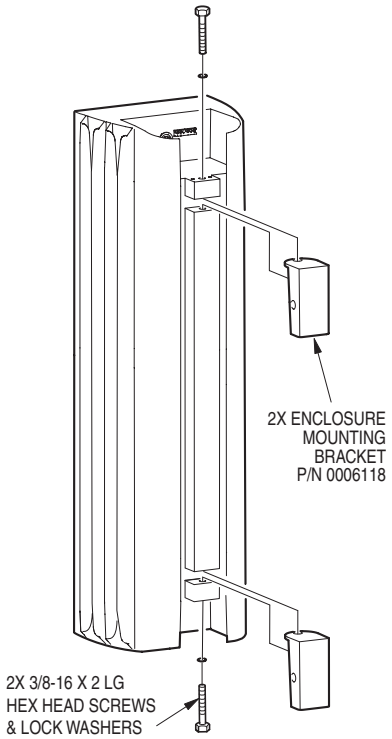


Figure 5.6.8 Enclosure Bracket Installation

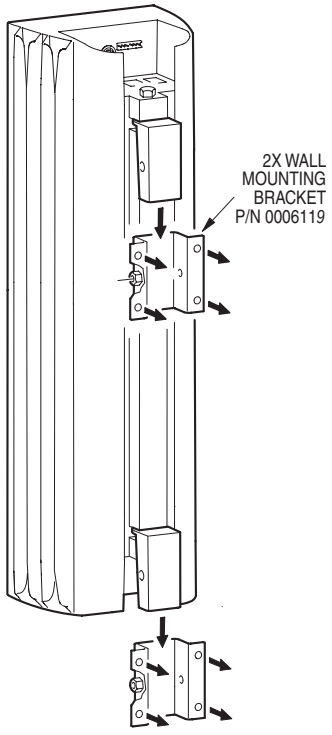
5.6.8 ENCLOSURE BRACKET INSTALLATION

Insert each supplied Enclosure Bracket into its slot near each end of the enclosure, verifying the proper orientation of the enclosure. Insert a supplied 3/8-16 x 2 in Enclosure Bracket Bolt with its lock washer into each bracket bolt hole in the enclosure. Thread each bolt into the weld nut on its Enclosure Bracket and hand-tighten.

Caution: Make sure the brackets are installed so the enclosure orientation will be correct when the enclosure is mounted.

5.6.9 ENCLOSURE INSTALLATION

1. Lift the enclosure onto the structure-mounted Wall Brackets



DANGER: IT IS RECOMMENDED THAT LIFTING THE ENCLOSURE IN PLACE BE PERFORMED BY AT LEAST TWO PEOPLE TO PREVENT IT FROM FALLING DURING ITS INSTALLATION AND CAUSING POSSIBLE EQUIPMENT DAMAGE, INJURY, OR DEATH.

CAUTION: For DSAi Clusters with two or more modules mounted one over the other, it is recommended to make all cable connections before lifting the modules onto the wall brackets. See Sections 5.2 through 5.5. Once the modules are mounted, access to the connectors may be difficult.

IMPORTANT: When installing modules mounted vertically end to end, install the lower module first.

Figure 5.6.9a Enclosure Installation

2. Install at least one of the supplied 1/4-20 X 3 in Retainer Bolts with its lock washer through the side of either the top or bottom Wall/Enclosure Bracket and snugly tighten. The bolt threads into a weld nut on the side of the Wall Bracket. This Retainer Bolt prevents the enclosure from being lifted off the Wall Brackets without first removing the bolt. Note that the Retainer Bolt does not "clamp" or support anything. It serves only to retain the enclosure on the wall brackets, not to lock it into position.

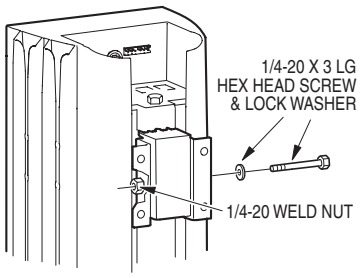


Figure 5.6.9b Retainer Bolt Installation

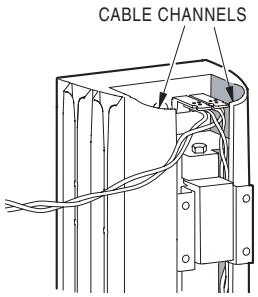


Figure 5.6.9c Cable Routing

3. Route cabling as required using the rear channels in the enclosure's extrusion.

4. Rotate the enclosure to the desired horizontal angle. Firmly tighten each Enclosure Bracket Bolt to secure the enclosure in the desired position.

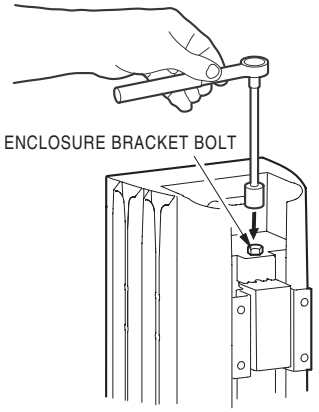


Figure 5.6.9d Secure the Enclosure Position

5.7 Initial Set-Up

5.7.1 VERIFY MODULE ORIENTATION AND POSITION

Using DSAPilot and with communications established with the modules, click on each module in DSAPilot. The LED in both the DSAPilot graphic and on the actual module will illuminate. Ensure it is the correct module and that its physical orientation, and, if applicable, its position in a cluster corresponds to that shown in the DSAPilot graphic. See the DSAPilot help file for further information.

CAUTION: Incorrect orientation or cluster position will result in poor to unusable performance.

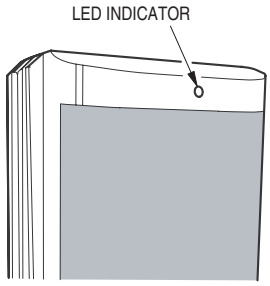


Figure 5.7.1 Identification LED

5.8 Acoustical Installation

Adjustment of the signal processing and thus the acoustical performance for each DSAi Cluster is accomplished using the DSAPilot software. Complete instructions for its use can be found in the DSAPilot Help file.

These are the basic tasks that need to be done using DSAPilot:

1. Select each cluster configuration used in the system design.
2. Assign the installed clusters to those selected in DSAPilot.
3. Set the Steering parameters for each cluster.
4. Configure the audio input routing for each cluster.
5. Set the user-adjustable gain, EQ, compression, or signal delay for the inputs.
6. Set the desired Power Saving operation.
7. Save the final signal processing settings for the system to a file.

Chapter 6 Operation

This section provides details about DSAi operation. The general operation of a DSAi module is similar to the operation of most loudspeakers. Initial system set-up and overall tuning adjustments detailed in this Chapter must be made using DSAPilot. For details about using DSAPilot functions refer to the DSAPilot Help File. Operation is largely concerned with adjusting the operating levels, avoiding excessive input signals and, if needed, making in-performance “voicing” adjustments using external equalization.

These operation instructions assume that the module has ac mains, audio signal, and computer control lines properly connected, and that they are passing signals correctly.

6.1 Operational Functions

There are several, unique functions that affect and enhance operation. These include Power Management, LED Indicator, and signal Monitoring.

6.1.1 POWER MANAGEMENT

The Power Management feature is a power saving function that improves energy efficiency. This feature automatically puts the DSAi amplifiers into stand-by mode similar to a computer monitor. The initiation of this mode occurs after the input signal is absent for a period of time.

Enable or disable this function using DSAPilot. If enabled, the period of time the input signal must be absent before entering stand-by is adjustable. In addition, DSAPilot allows forcing the standby condition should the need arise to de-activate the amplifiers without disconnecting the ac mains.

6.1.2 LED INDICATOR

The LED Indicator located on the front of a DSAi module at the “Signal End” can be set to indicate the status of several operating conditions. Enable or disable each indication using DSAPilot. The actual conditions monitored by the LED are not affected by enabling or disabling the LED indication.

1 Initialization: The LED on the “Signal End” will flash rapidly for about 3 seconds when first powered on. This is normal and indicates the electronics are being initialized. The LED should then go off. This indication is permanently enabled.

2. Input Clip: If this indication is enabled, random flashing shows that the audio input signal is clipping the A to D converters at the input. To correct this condition, reduce the input signal level at the source. Because the input gain is after the A to D converters, the DSAi input gain adjustment will have no effect on this condition.

NOTE: This is likely an unusual condition because the LED will respond only if the input signal levels are greater than +24dBu. It is recommended that this function normally be disabled.

3. Output Compressor/Limiter Active: If this indication is enabled, random flashing shows that the amplifier output compressor/limiters have been activated. Occasional flashing is acceptable. Flashing more than once every few seconds means the input signal level is too high. To correct this condition during a performance, reduce the input signal level at the signal source. If the source levels must normally be run at such levels, then reduce the DSAi input gain using DSAPilot. Because of possible audio artifacts, this latter adjustment should not be done during a performance.

   NOTE: It may be desirable to disable this indication to avoid the audience seeing flashing LEDs, particularly on dynamic program. In this case, determine the source level that triggers the Output Compressor/Limiters. Monitor and control the source level so as not to exceed this pre-determined trigger level. This will help prevent the DSAi Output Compressor/Limiters from activating more than occasionally.

4. System Fault: If this indication is enabled, flashing at regular intervals indicates a fault in the DSAi's electronics. Faults include malfunctioning amplifiers or DSPs, over temperature, and low battery. If a fault is indicated, use DSAPilot to determine the exact problem. See Section 5.3 for information about monitoring system faults.

   NOTE: A battery is used to retain the DSAi module's settings when disconnected from the ac mains. A low battery requires replacement by the EAW Service Department or the service department of the EAW Distributor for your country. Expected battery life is 10 years without being connected to the ac mains.

5. Identification: Using DSAPilot during initial system set-up, this function is used to physically identify with which cluster DSAPilot is communicating. Selecting a cluster or an individual module within a cluster in DSAPilot will turn on the LEDs in the corresponding enclosures.

6.1.3 SIGNAL MONITORING

Real-time Input and output signal levels can be monitored using DSAPilot.

6.2 Operational Check List

To operate a DSAi module, pre-performances checks and adjustments should be made. In typical permanently installed applications, these checks would normally be one-time, set-up adjustments that may only need to be periodically verified. All of these steps require using DSAPilot.

1. Set the Power Management function as appropriate for your application.
2. Select each cluster in the DSAPilot design and verify the LED indicator illuminates on the corresponding physical cluster.
3. Verify that the LED indicator on each enclosure is at the top or bottom as shown in DSAPilot.
4. Adjust the input gain for each cluster for the desired nominal output level for the expected input signal levels.
5. Adjust the input EQ for each cluster for the desired voicing to accommodate room acoustics, program content, or personal taste.
6. Adjust the input Limiting for each cluster to prevent higher than desired output SPLs.

6.3 Normal Operation

6.3.1 POWERING UP

Power is applied to DSAi in one of three ways:

1. Always On: Connect the module to a continuously powered ac mains supply. The module is always ready for use. For this mode, disable the Power Management function.
2. Off/On: Connect the module to an ac mains supply which is switched on and off between uses. The ac mains must be switched on for each use. For this mode, disable the Power Management function.
3. Standby/On: Connect the module to a continuously powered ac mains supply. The module will be ready when input signal is applied. For this mode, enable the Power Management function.

6.3.2 SIGNAL PROCESSING SETTINGS

When powered up, the signal processing in each module will be set to what it was for the previous use. The signal processing settings are retained by non-volatile memory in each module. This memory will last indefinitely when connected to the ac mains. When disconnected from ac mains, a battery supplies power to this memory. The expected battery life without being connected to the ac mains is 10 years.

6.3.3 OPERATION

Operate DSAi similarly to any other loudspeaker. This normally involves setting the source levels to achieve the desired output as well as applying external equalization or other signal processing to achieve certain desired results. DSA's internal user signal processing, set using DSAPilot, should not be used for in performance adjustments.

6.4 Operational ‘DOS’ and ‘DONT'S’

6.4.1 EQUALIZATION

If equalization is required for tailoring the frequency response during performances, use an external equalizer such as a good quality 1/3 octave graphic equalizer, for this purpose. Connect the equalizer inline with the DSAi input signal. DSA’s user input equalization, adjusted via DSAPilot, should be used only for overall tuning adjustments made during initial system set-up.

6.4.2 MAXIMUM OUTPUT

At the highest usable operating levels, the LED Indicator on the module and in the level meters in DSAPilot should show no more than occasional clipping. Occasional clipping means the LED indicator, if enabled, and DSAPilot meter will indicate clipping at most once every few seconds.

6.4.3 FREQUENCY CONTENT

Do not attempt to boost low frequencies below about 100 Hz. The 4 in drivers DSAi module are not designed to replace subwoofers if strong, very low frequency response is needed. Boosts below 100 Hz can greatly increase the cone excursion and can use up much of the amplifier power available. These conditions can significantly reduce the overall maximum output.

6.4.4 INPUT LIMITING

The input limiting should not be used for driver protection. There is fixed, internal compression and limiting to help prevent driver damage from excessive amplifier output levels. These limiters will automatically activate in the presence of excessive signals. The LED indicator can be enabled to indicate activation of the protection circuits. See Section 6.1.2.

6.4.5 DSAPILOT ADJUSTMENTS

Do not make adjustments using DSAPilot during normal operation. The reason is that changes to the DSAi module’s electronics requires successively updating all internal parameters. Because there is a complete DSP engine for each transducer, updates can take a noticeable amount of time. Depending on the magnitude of any changes, sonic artifacts may result while the updates are taking place.

Chapter 7 Maintenance and Service

This chapter provides information about warranty coverage and service.

7.1 Warranty

See the supplied warranty card for warranty details.

7.2 Service Items

There are no field serviceable parts for the DSA250i or DSA230i. Service and repair information must be obtained by contacting the EAW Service Department or the service department of the EAW Distributor for your country. See Section 7.3 for contact information.

7.3 How to Contact EAW

We have attempted to answer any questions you may have about the DSAi Series in this manual and the associated guides. Should you need further assistance, you can contact us in several different ways.

7.3.1 OPERATING QUESTIONS

For questions about configuring or operating the modules, contact:

EAW Application Support Group
Tel 800 992 5013
Tel +1 508 234 6158
Fax +1 508 234 8251
e-mail asg@eaw.com

7.3.2 SERVICE INFORMATION

For questions about troubleshooting or servicing a DSAi Series module, contact:

EAW Service Department
One Main Street, Whitinsville, MA 01588 USA
Tel 800 992 6001
Tel +1 508 234 6001
Fax +1 508 234 3776
e-mail service@eaw.com

7.3.3 GENERAL

For all other information:

Eastern Acoustic Works
One Main Street, Whitinsville, MA 01588 USA
Toll Free 800 992 5013
Phone +1 508 234 6158
Fax +1 508 234 8251
Web Site http://www.eaw.com
e-mail info@eaw.com

Chapter 8 Appendices

8.1 Inspections and Maintenance

8.1.1 PERIODIC PHYSICAL INSPECTIONS

Complete and thorough inspections should be done on a routine, periodic basis. The interval between inspections and scope of the inspections will depend on the conditions of use. This interval must not exceed 1 year.

All mountings and enclosures should be visually examined for any condition that may affect mounting integrity. A complete inspection should include, but not be limited to, looking for these types of damage to DSAi Series modules and parts:

bends
breaks
broken parts
corrosion
cracks
cracks in welded joints
deformation

DANGER: Should any of the above listed types of damage exist, immediately remove the affected part from service for repair or replacement. If there is any question about the integrity or capability of any mounting or rigging part to perform its intended function, it must be immediately removed from service for repair or replacement.

8.1.2 PERFORMANCE TESTING

Listening tests and/or formal measurements should be done periodically. The interval between such tests will depend on the frequency of system usage and the conditions of use. All transducers should be tested for functionality and proper performance.

Careful listening will usually reveal transducer and/or enclosure problems in the form of distortion, buzzes, rattles, or non-function.

8.1.3 CLEANING

The sides and rear of the enclosure function as a heat sink for the internal amplifiers. Because of this, they must remain relatively free of dust and dirt to ensure good heat transfer to the surrounding air. If these surfaces need cleaning, use a vacuum and/or damp cloth to remove any dust or dirt.

CAUTION: To avoid damaging the exterior finishes do not use cleaning solvents or abrasives.

8.2 Troubleshooting

This troubleshooting table addresses some common faults. For other difficulties not listed, contact the EAW Service Department.

SYMPTOM	POSSIBLE CAUSE	SOLUTION
DSA250i Only:		
No HF output	Failed internal component	Module needs service.
No HF output from one or more drivers	Failed internal component	Module needs service.
DSA250i and DSA230i:		
Modules connected within a cluster by the Signal Link jacks do not function	Supplied Link Cable is faulty	Check link cable for proper operation and ensure the RJ-45 connectors are fully engaged when inserted.
Modules connected within a cluster by the Signal Link jacks do not function	User-supplied link cable is incorrect	Ensure link cable is wired as a standard Ethernet crossover cable and is less than 2 ft / 0.6 m long
No LF output	Failed internal component	Module needs service.
No LF output from one or more drivers	Failed internal component	Module needs service.
No output	Incorrect connections	Check that input cabling to the module is wired correctly for the +/- signal wires and cable shield.
No output	Module is off	Check that power is supplied to the module power cable and that the cable is connected to the module.
No output	Module is off	Check the fuse on the power end of the module. Replace if blown. If the fuse blows again, the module requires service.
No output	Amplifier is off	Using DSAPilot, check that the power management functions are set correctly.
No output	No input signal	Using DSAPilot monitoring function, check that there is signal at the input. If not, disconnect and check for signal on the audio input cable to the module.
No or low output	Input level is not set correctly	Using DSAPilot, check that the gains for the input(s) being used are set properly.

Coverage is incorrect	Improper set-up	Using DSAPilot, ensure the desired beamwidth and aiming angle are correct.
Coverage is incorrect	Module upside down	Using DSAPilot to active the module's LED indicator, ensure the up/down enclosure orientation is correct for the application.
Distorted sound	Failed internal component(s)	Using DSAPilot's Service Mode, check the operation of each amplifier and driver.
Distorted sound	Excessive levels	Using DSAPilot, monitor the DSAi signal path to check for clipping at all monitoring points.
Distorted sound	Bad input signal	Use a substitute amplifier and module to check the quality of the input signal to the DSAi Series module.
EIA-485		
No computer communication	Incorrect PC set-up	Follow the instructions in the DSAPilot Help File for configuring PC communications for DSAPilot.
No computer communication	Incorrect connections	Check that EIA-485 cabling to both the computer and the module is wired correctly for the +/- signal wires and cable shield.
No computer communication	Incorrect termination	Ensure that a termination is engaged at the EIA-485 port at the computer and the Terminate Switch is "ON" at the module at the farthest end of the EIA-485 cable run. All other Terminate Switches should be "OFF".
No computer communication	Module is powered off	Ensure the module is powered on.
No computer communication or only with some modules	Improper network configuration	Ensure the EIA-485 cabling and termination conforms to the notes in Section 8.3.
No computer communication	Improper link connections	Ensure the EIA-485 only cabling with some modules between modules and/or the supplied RJ-45 Signal Link Cables are connected between modules as detailed in this manual.

CobraNet

Audio signal or computer communication not functioning or not functioning correctly	Network cabling does not meet specification	Ensure Ethernet cabling meets IEEE 802.3u specifications for 100BASE-T networking.
Audio signal or computer communication not functioning or not functioning correctly	CM-1 Interface Card malfunctioning	Replace with a known good CM-1 Interface Card to determine if the removed card is faulty.
Other CobraNet problems	Network or digital audio not properly implemented	Refer to either IEEE 100BASE-T or Peak Audio documentation to troubleshoot network or digital audio difficulties.

8.3 EIA-485 Network Notes

EIA-485 network cabling has certain limitations that these notes summarize. Improper set-up of an EIA-485 network can result in faulty or no operation. To use EIA-485 network configurations or cabling schemes not addressed in this manual, consult a qualified network professional.

8.3.1 CABLING NOTES:

1. Single Module or module cluster:
   One end of the EIA-485 cable is connected to the computer's EIA-485 port and the other to the EIA-485 connector on the module or on one of the modules in a cluster.
2. Multiple Modules:
   One end of the EIA-485 cable is connected to the computer's EIA-485 port. The cable is then connected daisy-chain fashion to multiple modules or clusters. This means to connect the EIA-485 cable from the computer to a module or cluster, then to loop it to additional modules or clusters. Use the supplied RJ-45 Signal Link Cables to link modules within a cluster using the Signal Link jacks. This cable also interconnects the audio between the modules.
3. DO use an EIA-485 hub when separate EIA-485 home runs to the computer are needed because of cable routing constraints. Note: EIA-485 hubs often contain an RS-232 to EIA-485 converter.
4. DO use an EIA-485 hub to extend the length of the EIA-485 cabling beyond 1000 ft / 300 m.
   Literature about EIA-485 claims maximum cable lengths of 4,000 ft. However, the fastest data rates for a DSAi network, assuming ideal network conditions, limit the maximum to 2,800 ft / 850 m. Performance variations for the network cable, connectors, EIA-485 drivers, and several other variables can and often do further reduce this length. Therefore, this is the maximum recommended length to ensure reliable communications.
5. DO use an EIA-485 hub to connect the EIA-485 network to more than 31 DSAi Clusters.
   Each module within a multi module DSAi Cluster counts as one DSAi Cluster if they are all connected DIRECTLY to the EIA-485 network using the EIA-485 Phoenix connectors. If the modules within a multi-module DSAi Cluster are inter-connected via the Signal Link connectors, and thus only one is connected directly to the EIA-485 network, then this counts as only one DSAi cluster.
6. DO NOT connect the EIA-485 cabling to the modules in a star fashion.
   This means do not home-run an EIA-485 cable from each module or cluster to the computer.
7. DO NOT connect the EIA-485 cabling between modules in a star fashion.
   This means do not run an EIA-485 cable from one module or cluster to more than one other module or cluster.

8. DO NOT connect modules or clusters in a “stub” fashion.
   This means do not connect a branch cable off an EIA-485 cable to run to a module or cluster.

9. DO NOT connect the far end of the EIA-485 cable back to the computer.
   This means do not make an electrically closed loop for the EIA-485 cabling.

8.3.2 TERMINATION NOTES:

1. The DSAi Terminate Switch connects a 120 ohm resistor as a load on the EIA-485 cabling.

2. Normally, USB to EIA-485 or RS-232 to EIA-485 converters also have a termination resistor connected as a load on the computer end of the EIA-485 cabling. If optional, this termination should be switched on. Both this termination resistor and the one in the module at the far end of the EIA-485 cabling from the computer are required to ensure proper network operation.

3. Due to inherent current limitations, the load resistance on EIA-485 hardware must be greater than 50 ohm. This means only ONE module Terminate Switch can be “ON” on the EIA-485 network along with the converter’s termination resistor. If more than one module Terminate Switch is “ON”, the network can experience intermittent or non-existent communications. Additional terminations needlessly draw more power from the RS-485 converters, reducing signal strength.

4. The Terminate Switch only works for the EIA-485 cable connection at the Phoenix Contact connector. The Terminate Switch does not work for EIA-485 connections between modules using the Signal Link connectors. Therefore, use the Terminate Switch only on the module within a cluster that is connected to the network via the Phoenix connector.

8.4 Support For Ethernet

The infrastructure for a CobraNet network must be designed and built using standard IEEE 802.3u 100BASE-T Ethernet network hardware. As this is a standardized technology, EAW does not provide technical support for Ethernet networking. Standards and technical documentation for the design, set-up, operation, and troubleshooting of 100BASE-T Ethernet networks are available from a variety of sources on the Internet.

8.5 Support For CobraNet

CobraNet technology relies on specific and exacting network timing issues to deliver digital audio to its destination intact and with no dropouts. As such, there are certain limitations to how an Ethernet network for CobraNet can be designed. DSAi requires that CobraNet be set to use multicast bundles. For specific information about designing a CobraNet-compliant network, contact:

Peak Audio (A Division of Cirrus Logic)
305 Interlocken Parkway
Broomfield, CO 80021-3484
Phone: 303-466-5228
Fax: 303-464-6776
e-Mail: info@peakaudio.com
Web: http://www.peakaudio.com

NOTE: Peak Audio’s web site provides, on-line information about designing an Ethernet network that complies with CobraNet requirements. It also provides links to information about Ethernet technology.

8.6 DSAi CONNECTIONS

This appendix discusses the operation of the DSA's communications system, some additional connection configurations, and why things go wrong if not connected properly.

8.6.1 BACKGROUND

Phoenix Audio Connectors: The two balanced Phoenix audio connectors are for standard, line level, analog audio signals. This analog audio is converted to digital in each DSAi unit. The audio connections to the Link Port connectors are made by the firmware.

CobraNet Audio: The DSAi implements CobraNet Audio using the multicast bundles 1-255. The communication is implemented using the serial bridge feature. All communications sent through CobraNet is received by all other CobraNet cards on the network. The digital audio from the optional CM-1 CobraNet card is connected to a digital input within the module. Because there is no digital to analog conversion, there is no audio signal at the Link Ports.

EIA-485 port: This Phoenix connector is for control data sent over an EIA-485 bus from the computer. It provides a 115200 bps, dc-isolated connection with a selectable 120 ohm termination. This connector is directly wired internally to the Link Port connectors and, via an option in DSAPilot, to the CobraNet port.

CobraNet Slot with CM-1 Card: The DSAi communicates over the CobraNet card using the serial bridge interface. All audio and control data sent over the serial bridge is received by all other CobraNet devices on the network. Control data communicated over EIA-485 can be connected, via an option in DSAPilot, to the CobraNet Slot.

Link Ports: The link ports carry balanced audio from the Phoenix Audio connectors as well as control data from the Phoenix EIA-485 connectors and CobraNet card, if installed. These connections are made by the firmware.

8.6.2 DSAPILOT COMMUNICATIONS

Each DSAi module has four ports through which it can communicate with DSAPilot:

- EIA-485
- CobraNet Card Slot
  (requires the optional CobraNet CM-1 Card)
- Signal End Link Port (SLink) in the end cap with the LED
- Power End Link Port (PLink) in the opposite end cap

Each DSAi module has a unique address, even if it is one of two or more in a multiple module DSAi cluster. In DSAPilot, individual module addresses in a cluster are grouped so that the cluster appears as one larger loudspeaker to the user. Behind the user interface, the communication is with either individual module addresses or a global address, to which all modules and clusters in a system respond. An example of the latter is setting the LED Functions.

8.6.3 EIA-485

Figure 8.6.3a is the simplest setup with an EIA-485 bus connection to DSAi module "A" and with a Link Ports connection to DSAi module "B". These modules could be operating individually or as part of a cluster.

Only the "A" module EIA-485 port is connected to the PC and there is a Link Port connection between the "A" PLink and the "B" SLink.

When a DSAi module receives a message (the source is not important) it checks the message address to see if it matches its own address. If it matches, the module will use the message.

In the example Figure 8.6.3a, the PC is sending a message to module "A". The message address matches its own address so it uses the message

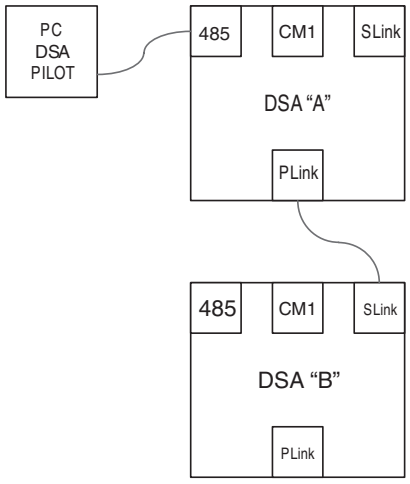


Figure 8.6.3a EIA-485

Figure 8.6.3b illustrates what happens when the message is for another module, in this case module "B". If the message address does not match, DSAi module “A” will repeat the message out of all its communication ports except for the one where the message was received. As shown in Figure 8.6.3b, module "B" would get the message through the Link Ports.

The reason module “A” blindly repeats the message like this is that it does not know which communication port is connected to module "B" or to any other modules.

If it received the message through the EIA-485 port, it would repeat the message to the SLink, the PLink and to the CobraNet CM-1 card, if installed.

This communication method of blindly passing on control messages is the basic principle behind the DSAi communication system. It is simple and works well. However, incorrectly configured control data wiring will lead to communication loops. Communication loops mean that communications will fail, often randomly.

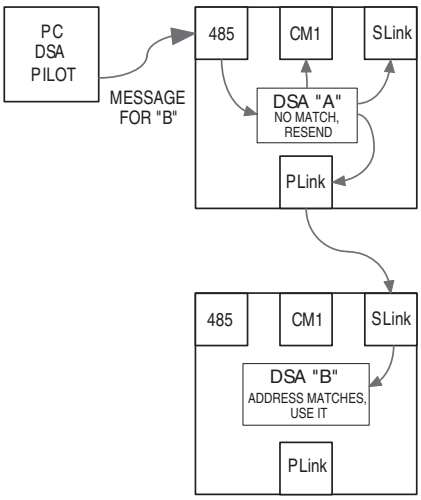


Figure 8.6.3b EIA-485

8.6.4 EIA-485 CONSIDERATIONS

The EIA-485 connection is very durable when used correctly. It is capable of controlling many devices over very long distances. It is important to understand the limitations of this networking bus to avoid loss of communication. Three things are of primary importance.

1. Avoid T-branches: these will invariably cause loops somewhere in the system.
2. Avoid stubs or branches: these will disturb the bus impedance causing signal reflections and resulting data corruption.
3. Ensure the 120 ohm end of line termination is configured correctly. Incorrect termination means the same problem and results as in #2.

In the examples below, it does not matter if the modules in the system are configured into clusters or operated individually. Because of their length restrictions, where Link cables are shown, the modules so connected would be in close physical proximity.

8.6.5 PROPER DSAI INSTALLATIONS

Here are some examples of DSAi installations that will work reliably, both avoiding loops and keeping EIA-485 running well. These can be used as a basis for larger and more complex installations.

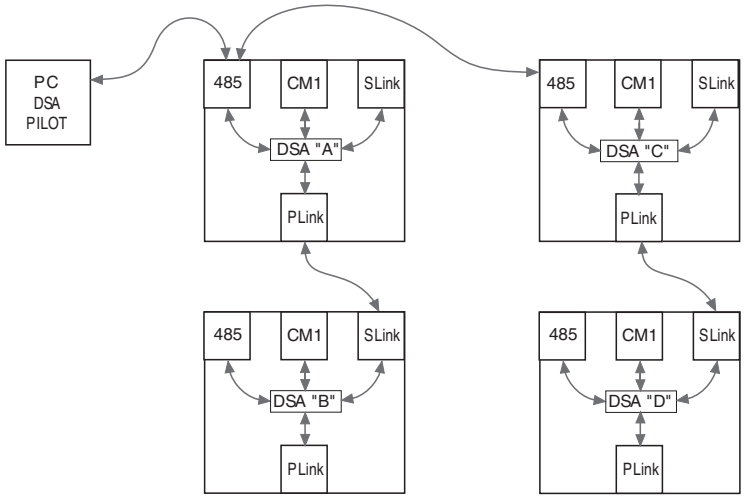


Figure 8.6.5a Example 1

EXAMPLE 1:
This is a simple EIA-485 network connected directly from the PC, which runs DSAPilot, to DSAi "A" and then daisy-chain fashion to "C". Because they are in close physical proximity, Link cables are used to connect the control data and audio to "B" and "D". The termination switch for "C" is on. The termination switch should be off on all the other modules.

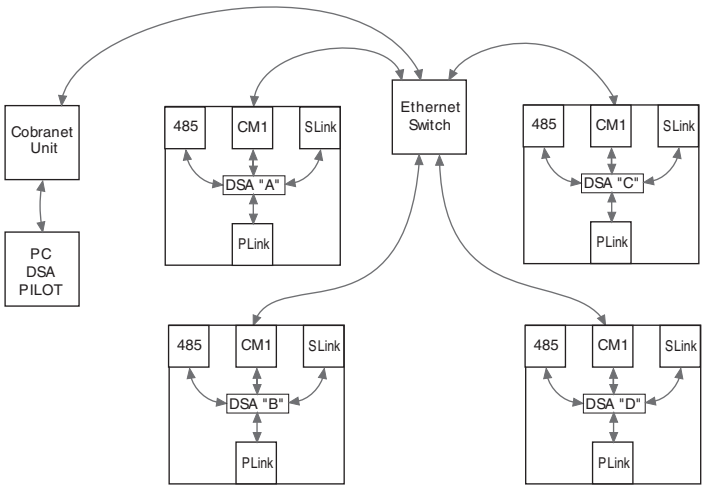


Figure 8.6.5b Example 2

EXAMPLE 2:
This is a standard CobraNet connection. Just like computers connected using Ethernet, each module, whether used singly or in a cluster, requires its own a connection to a network switch. No Link cables are used. The DSAPilot PC communicates to all DSAi modules through the serial bridge in the CobraNet Unit.

EXAMPLE 3:
Should you be working with a CobraNet Audio source that does not support the serial bridge feature, you can follow this next connection scheme. The DSAPilot PC is connected to DSAi module "A" using an EIA-485 link. "A" communicates the data to the other modules over the CobraNet serial bridge through DSAi module "A".

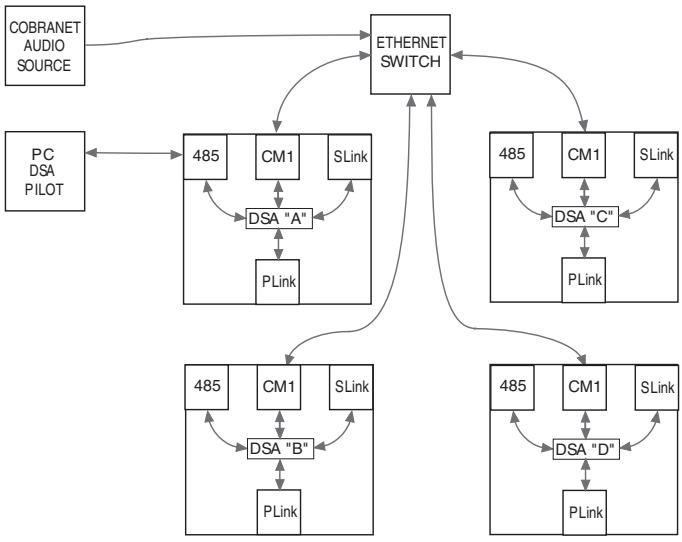


Figure 8.6.5c Example 3

EXAMPLE 4:
This is a more complex configuration where both analog and CobraNet digital audio are required to be connected to the modules. It is important that you do not use the link connectors. Doing this would cause a communication loop through the link connector and the CobraNet interface.

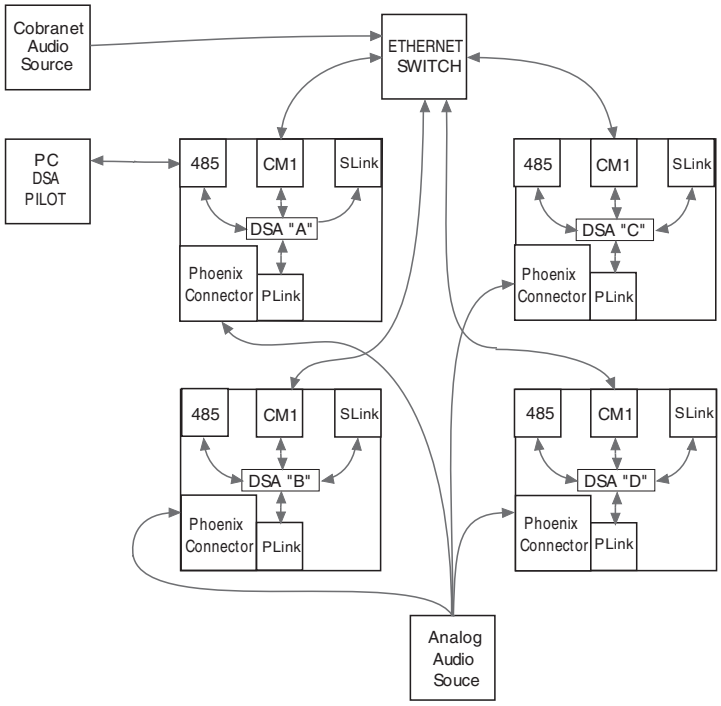


Figure 8.6.5d Example 4

8.6.6 AVOIDING COMMUNICATION LOOPS

Communication loops will occur if a computer control message can find more then one path to a DSAi module. The consequence of this is that the network can quickly become overloaded with likely intermittent and/or faulty communication. When determining your system connections, draw it out and see if a loop will be created. Just follow the arrows. Here are some examples to NEVER repeat.

EXAMPLE 1: (no figure shown)
One cabling configuration that you should NEVER make is to daisy-chain the EIA-485 cabling from module to module then home run a cable from the last module back to the PC to create a closed loop. This may seem like a good idea because, if there is a break anywhere in the cable, there will still be a connection back to the PC. The key words here are that this will CREATE A LOOP and loops are bad.

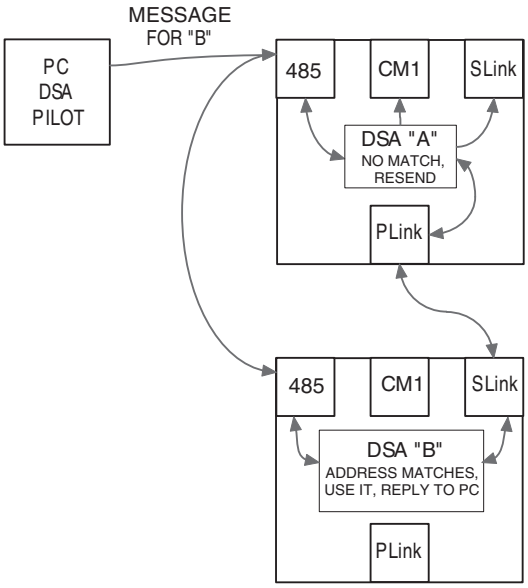


Figure 8.6.6a Example 2

EXAMPLE 2:
Here, DSAPilot sends a message to "B". This message requires a response from "B". Just like each DSAi modules, the PC has a unique address.

"B" will get the message from both the EIA-485 connection, and the PLink to SLink connection. Should "B" be required to respond to the message from the PC it will do so through the port or ports through which it received the message.

One path was to the EIA-485 port. So when "B" responds, back through this port, the PC gets the message but so does "A" through its EIA-485 port. "A"'s address won't match the PC address and so will forward it out its other ports thus sending the message back to "B" through the PLink to Slink connection. "B" will respond again this time sending it out its SLink port to "A". As the message is not for "A", "A" sends it out its EIA-485 port to the PC and "B" again. It responds through the receiving port, now the EIA-485, back to the PC and "A" again.

The other path for the message was to the SLink where "A" forwarded it. So "B" would also respond through that port and "A" would forward it out the EIA-485 port back to "B", and so on. The network will rapidly become saturated and from DSAPilot's point of view, very intermittent.

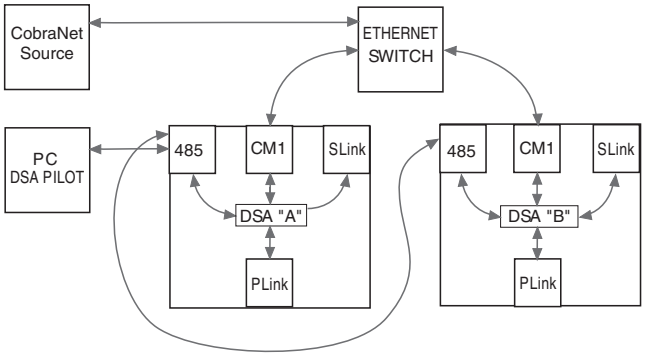


Figure 8.6.6b Example 3

EXAMPLE 3:
Here is another connection topology using CobraNet audio and EIA-485 computer control with a loop. Looping occurs through the RS485 and CobraNet. Just follow the arrows.

NOTE: See Example 4 in Section 8.6.5 to properly configure this topology or use DSAPilot to configure the Com Settings for Network audio and EIA-485 control. This disables the control connection from the CobraNet card to the EIA-485 bus, thus preventing a control loop through the CobraNet interface.

EXAMPLE 4:
Looping occurs between both the Link and CobraNet connections.

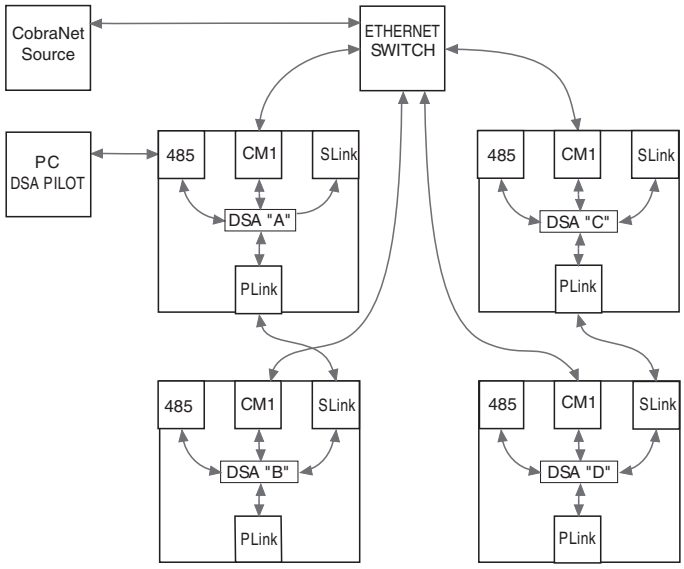


Figure 8.6.6c Example 4

8.6.7 AVOIDING STUBS AND CORRECT 120 OHM TERMINATION

A long stub or branch off of an EIA-485 bus can cause a significant impedance mismatch and thus reflections and degradation of the computer control signals. Stubs of several feet / 1 m or more are considered "long." Avoid using stubs. If a stub is necessary, keep it as short as possible to avoid communication problems.

Rule-of-thumb
You can avoid stub and termination issues by connecting no more than two EIA-485 cables at any one module. Turn on the termination switch only for the module with one EIA-485 cable connected to it. This will, by definition, be the one at the end of the cabling.

EXAMPLE:
This installation may have problems with the EIA-485 branch from DSAi "A" down to "B". If in close physical proximity, this cable can be replaced with a Link cable connection from "A" to "B". If this is a long distance, connect "C" to "B" instead of "A", as shown by the dotted line.

For either condition, the end of line termination is turned on only for "D". This is because "D" is at the opposite end of the daisy-chained EIA-485 cabling from the PC.

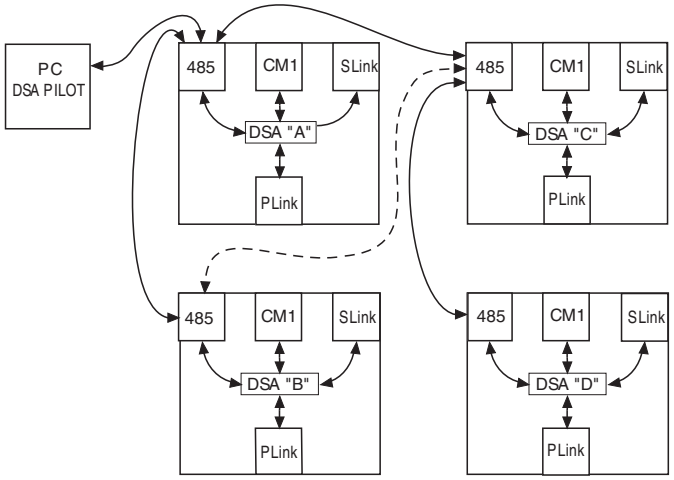
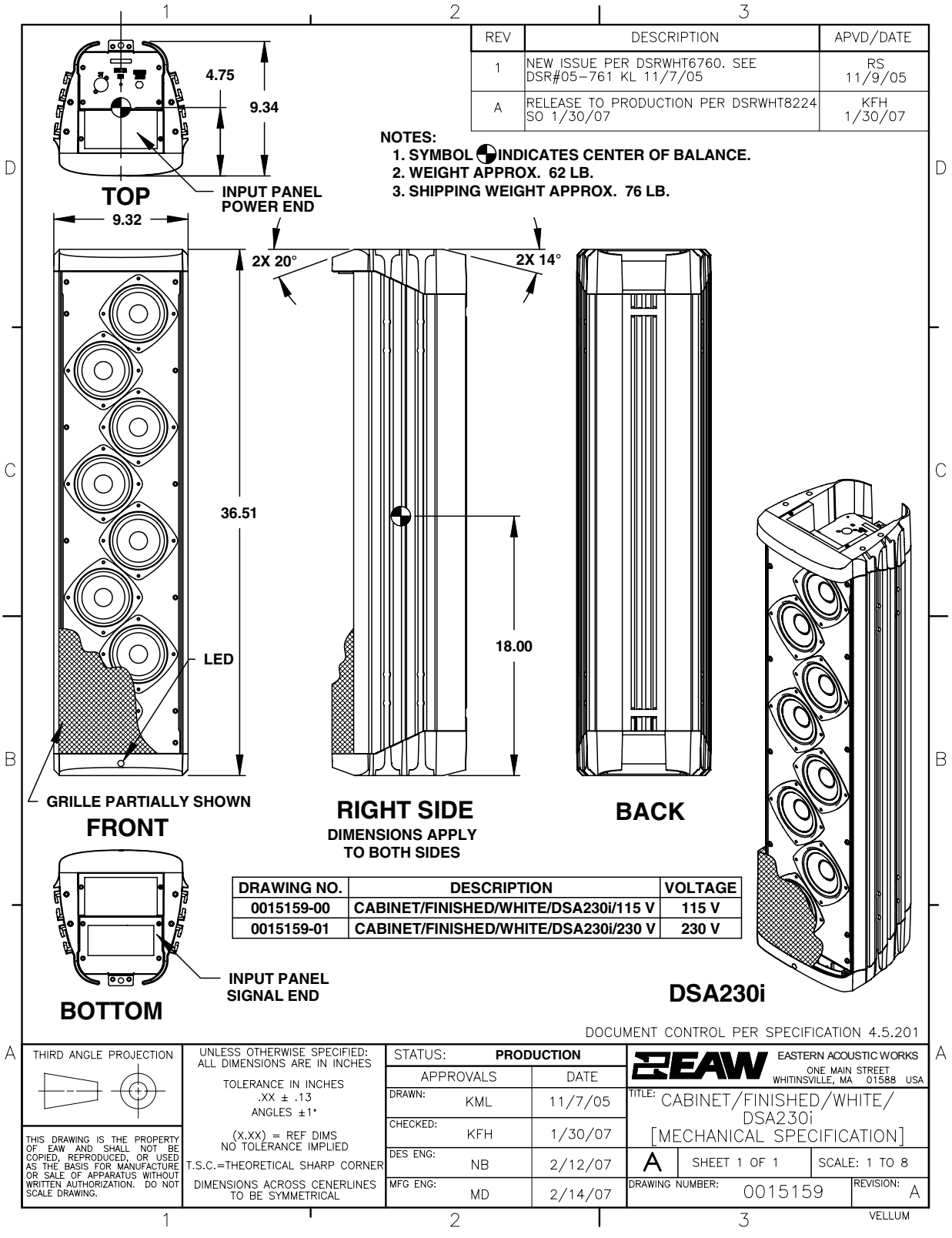


Figure 8.6.7 Example

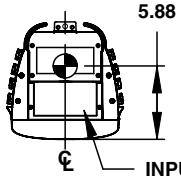
Chapter 9 Mechanical Drawings

9.1 DSA230i



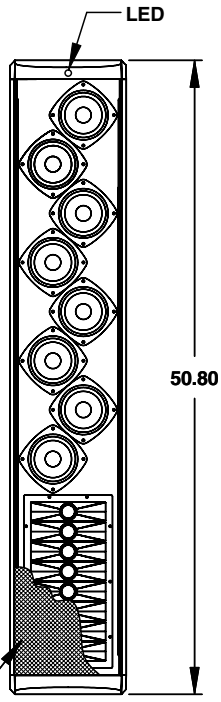
9.2 DSA250i

REV	DESCRIPTION	APVD/DATE
1	NEW ISSUE PER DSRWHT6760. SEE DSR#05-761 KL 11/7/05	RS 11/9/05
A	RELEASE TO PRODUCTION PER DSRWHT8224 SO 1/30/07	KFH 1/30/07

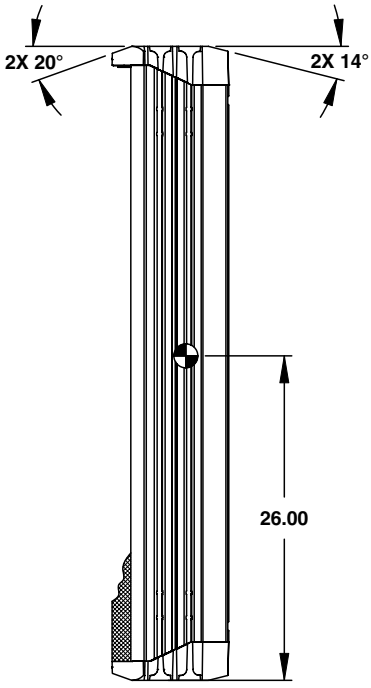


TOP

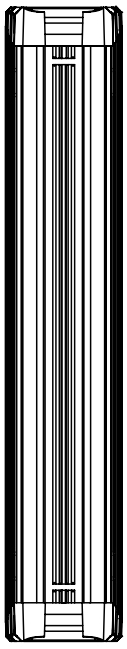
NOTES:
1. SYMBOL ⊕ INDICATES CENTER OF BALANCE.
2. WEIGHT APPROX. 84 LB.
3. SHIPPING WEIGHT APPROX. 100 LB.



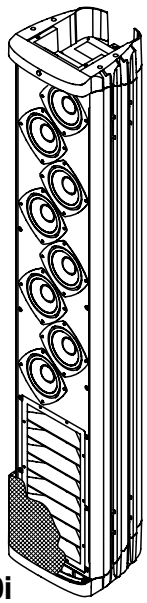
FRONT



RIGHT SIDE
DIMENSIONS APPLY TO BOTH SIDES

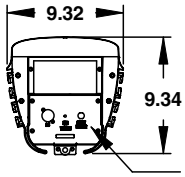


BACK



DSA250i

DRAWING NO.	DESCRIPTION	VOLTAGE
0015158-00	CABINET/FINISHED/WHITE/DSA250i/115 V	115 V
0015158-01	CABINET/FINISHED/WHITE/DSA250i/230 V	230 V



BOTTOM

DOCUMENT CONTROL PER SPECIFICATION 4.5.201

THIRD ANGLE PROJECTION

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UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES
TOLERANCE IN INCHES
.XX ± .13
ANGLES ±1°
(X.XX) = REF DIMS
NO TOLERANCE IMPLIED
T.S.C.=THEORETICAL SHARP CORNER
DIMENSIONS ACROSS CENERLINES TO BE SYMMETRICAL

STATUS: **PRODUCTION**

APPROVALS		DATE
DRAWN:	KML	11/7/05
CHECKED:	KFH	1/30/07
DES ENG:	NB	2/12/07
MFG ENG:	MD	2/14/07

EAW EASTERN ACOUSTIC WORKS
ONE MAIN STREET
WHITINSVILLE, MA 01588 USA

TITLE: CABINET/FINISHED/WHITE/ DSA250i [MECHANICAL SPECIFICATION]

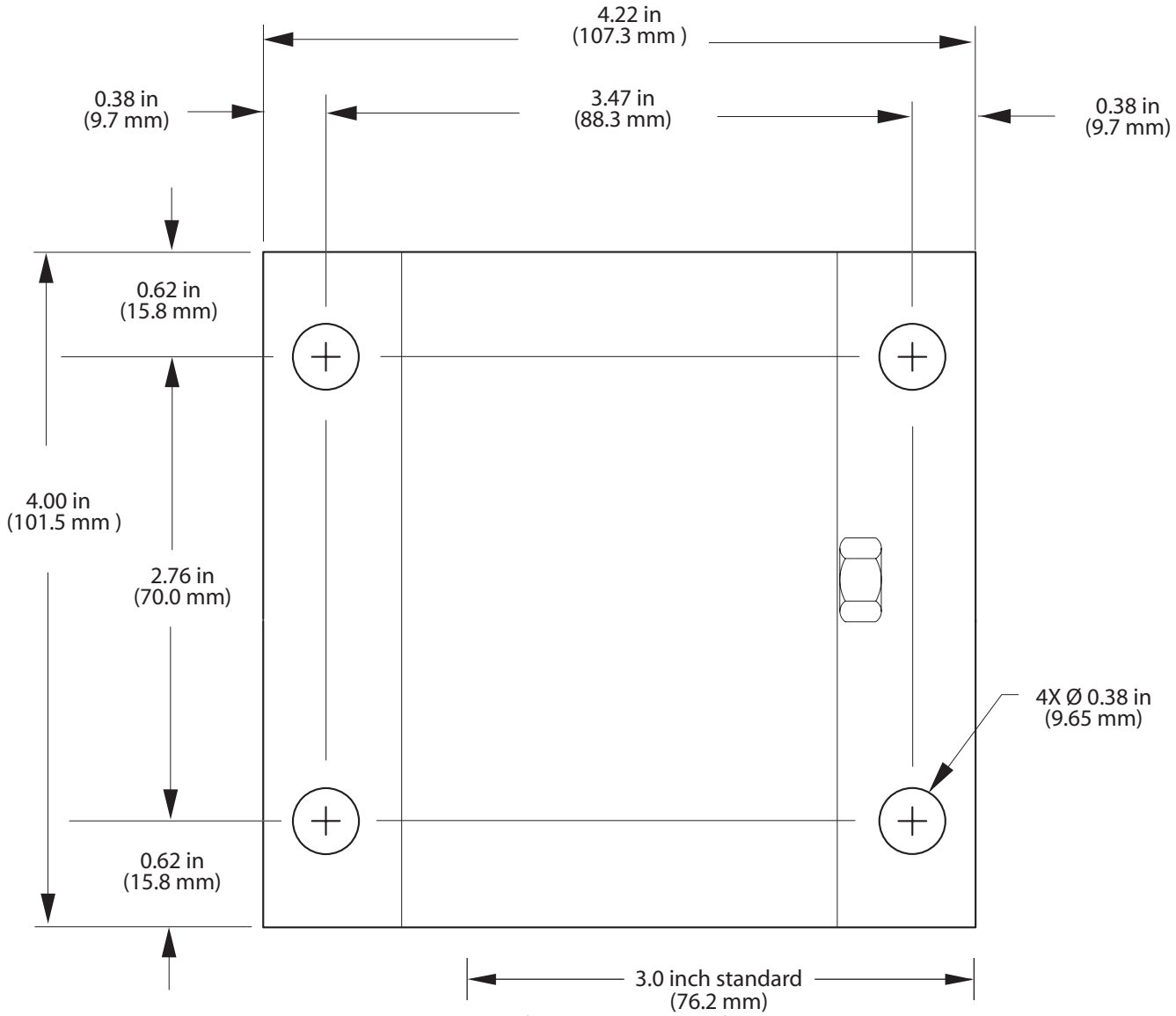
A | SHEET 1 OF 1 | SCALE: 1 TO 12

DRAWING NUMBER: 0015158 | REVISION: A

VELLUM

9.3 Wall Bracket

See Section 5.6.7 for Mounting Instructions.



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